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OF
LAKE SUPERIOR.

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REPORTS

ON THE

MINERAL REGION OF LAKE SUPERIOR,

WITH

A CORRECT MAP OF THE SAME,

AND

A CHART OF LAKE SUPERIOR.

BUFFALO:
L. DANFORTH, 230 MAIN-STREET.
1846.

REPORTS

OF

WM. A. BURT AND BELA HUBBARD, ESQS.

ON THE

GEOGRAPHY, TOPOGRAPHY AND GEOLOGY

OF THE

U. S. SURVEYS OF THE MINERAL REGION

OF THE

SOUTH SHORE OF LAKE SUPERIOR, FOR 1845;

ACCOMPANIED BY A LIST OF WORKING AND ORGANIZED MINING COMPANIES; A LIST OF MINERAL LOCATIONS; BY WHOM MADE,

AND A

CORRECT MAP OF THE MINERAL REGION,

DELINEATING THE TOWNSHIP AND SECTION LINES, AND THEIR CONNECTION WITH THE LOCATION LINES;

AND ALSO, A

CHART OF LAKE SUPERIOR,

REDUCED FROM THE BRITISH ADMIRALTY SURVEY.

BY J.acob HOUGHTON, Jr. and T. W. BRISTOL.

DETROIT:
PRINTED BY CHARLES WILLCOX.

1846.

Entered according to Act of Congress, in the year 1846,
By J. Houghton, Jr. and T. W. Bristol,
in the Clerk's Office of the District Court for the District of Michigan.

ADVERTISEMENT.

The public mind being, at the present time, directed with deep interest towards the mineral region of Lake Superior, and seeking, with eagerness, all information in regard to that interesting country, by the request of numerous friends, we have compiled this work, in order at the earliest possible period, to lay before all the latest and most accurate information. The map of the mineral region, so far as it relates to the township and section lines, is projected from the field notes of the surveys of 1845, and is correct. The locations are put down from the best data that could be collected. The most accurate map of the locations that could be obtained having a great many duplicate numbers, we were compelled to have recourse to descriptions of locations, and by these means we have made very many corrections and alterations. Still, there may be errors in regard to some of the locations, and should such be found, we trust the public will exercise some degree of lenity towards us, when they take into consideration the many conflicting difficulties under which we have labored. The chart of Lake Superior, is reduced from the one executed by Lieut. Henry W. Bayfield, who was engaged by the British government in the years 1824 and 1825, in making a survey of this Lake, and the most implicit confidence can be placed in its accuracy.

The Reports are the same as returned to the General Land Office, and give a concise and comprehensive description of the country over which the surveys have been extended.

In the list of Mining Companies, quite a number may have been overlooked; but when we look around and see new companies springing up daily, it becomes obvious that it is almost impossible to make out an entire list.

The Frontispiece represents the junction of the quartz rock with the sandrock, as seen between Chocolate and Carp rivers.

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DETROIT, FEB. 16, 1846.

SIR,

By contract with the Commissioner of the General Land Office, under date of June 25, 1844, the late DR. DOUGLASS HOUGHTON was required to make both a linear and geological survey of a section of country bordering on the south shore of Lake Superior. He was engaged in this work, which was nearly completed, at the time of his lamented death. As administrators of his estate, we have caused the field notes and papers connected with the survey, as far as completed, to be carefully examined, and the accompanying reports of Mr. Wm. A. Burt, and Mr. B. Hubbard, to be prepared. Mr. Burt, who was the principal assistant of Dr. Houghton in the field, reports in full as to the geology and topography of that portion of the country surveyed by him; and Mr. Hubbard, Assistant State Geologist of this State, and whom we employed for that purpose, has prepared a like full report upon the remainder of the surveyed territory, from the field notes of the survey and the specimens collected. We herewith submit these reports to you, with the field notes and other papers, &c. The linear survey, as far the work has progressed, is complete. It could not have been expected that the information, contained in the reports, in relation to the geology of the country, would be as complete and as accurate in detail, as it would have been, could they have been prepared by Dr. Houghton himself, who had, for many years, been zealously engaged in the investigation and study of the peculiar formations of this region. Enough, however, will appear, to enable the Government to appreciate, both the advantages, and the perfect feasibility, of the plan of connecting geological with the linear surveys of government lands, as originally proposed and zealously advocated by Dr. Houghton.

Respectfully, yours,

[SIGNED.] HENRY N. WALKER,
SAM'L T. DOUGLASS.

To HON. LUCIUS LYON,
Surveyor General, &c.

TOPOGRAPHY AND GEOLOGY

OF THE

SURVEY

OF A

DISTRICT OF TOWNSHIP LINES,

SOUTH OF LAKE SUPERIOR,

1845.

THIS survey embraces Keewenaw Point, and a narrow tract of land bordering the south coast of Lake Superior, from the south boundary of township 48 north, ranges 25 and 26 west, near Chocolate river, to the mouth of Carp river on the northwest side of the Porcupine mountains in township 51 north, range 44 west. (See the accompanying map, to which reference will be frequently made, in the course of these remarks.) Upon this map are delineated the boundaries of the survey, together with the principal streams and small lakes. The straight lines are the boundaries of townships with their numbers and ranges, and the irregular and dotted lines represent the boundaries of the different rock formations, with their characteristic names, on the side which they occupy.

The topography of this district may be divided into two parts, the hilly or mountainous, and the undulating or rolling lands.

Of the hilly or mountainous land, three tracts of considerable areas, are found widely separated by undulating or rolling land.

That part of the district between Huron Bay and the south boundary of township 48 north, ranges 25 and 26 west, and denominated primary range on the map, is made up principally of numerous rocky knobs and irregular hills, with intervening valleys of arable lands ; most of these valleys have small streams meandering through them, with rapid or quick currents of pure water. Between some of these knobs and hills, however, cedar, tamarack, or spruce swamps are found, and less frequently small lakes.

The highest elevations on this range, probably attain an altitude of 800 or 900 feet above the water of Lake Superior, and present to the spectator a very rugged and broken appearance, and frequently along the southeasterly slope of these knobs and hills, which is generally the most precipitous, high cliffs or sloping ledges are seen ; but along the south boundary of the survey, the hills are more regular in outline and have a westerly direction.

The land upon this part of the district not occupied by the primary range, is undulating and rolling except where furrowed with deep ravines or interrupted by the valleys of streams. These lands lie between the primary range and the Lake coast, and are in many places considerably elevated, forming bluffs on the Lake coast, from 20 to 80 feet in height.

SOIL AND TIMBER.

The soil on this part of the survey is generally a sandy loam, but in some places it is decidedly a sandy soil, and sustains a heavy growth of timber, of sugar maple, hemlock, birch, pine, cedar, fir, lynn, elm, ash, spruce, tamarack, &c.

STREAMS AND HARBORS.

The largest streams (rivers they are called here,) on this part of the district, are not above the size of ordinary mill streams, for which purpose they would answer well, having generally falls or rapids within one or two miles of the Lake coast. Some of these streams at their mouths form convenient harbors for small boats, and may be ascended with them to the first falls or rapids, for which purpose the Huron, Pine, Yellow Dog and Riviere Du Mort or Nekomenon river, are the best.

The only harbors for vessels are at Presque Isle, T. 48 N., R. 25 W., and to the south of a point of land on the east side of Huron Bay, T. 52 N., R. 31 W. (See map.)

TRAP RANGE OF KEEWENAW POINT, &c.

This second hilly range commences at the northeast end of Keewenaw Point, and has a course a little to the south of west, for about eighteen miles, where it gradually bends to the southward until its general course is southwest, to the south boundary of the survey.

This range is from two to six or seven miles wide, and about eighty miles in length upon this district, and, from the east end of Keewenaw Point, to a little west of the east boundary of range 29, these hills occupy nearly its entire breadth. Here the southeast side of this range recedes from the Lake coast, and stretching inland southwesterly, passes along the northwest side of a small lake in township 55 north, ranges 32 and 33 west; from thence generally in a southwest direction, to the corner of sections 31 and 32, on south boundary of T. 51 N., R. 37 W.

The northwest boundary of this range leaves the Lake coast in township 58 north, range 32 west, and stretching a little inland, crosses Portage Lake, in township 55 north, range 34 west, thence generally in a southwest direction, to near the corner of sections 33 and 34, on the south boundary of township 51 north, range 38, west. The highest elevations upon this hilly range, are supposed to be, from five to eight hundred feet above Lake Superior, and, as in the hills of the primary range already described, their southeasterly sides are generally the most precipitous; and it should be farther remarked that these hills are not destitute of interest in an agricultural point of view. Considerable tracts of tillable land are found upon them, with a good soil, and well timbered with sugar maple, birch, lynn, ironwood, red oak, &c., and, on Keewenaw Point, better adapted to cultivation than most of the land upon its coast. To the east of this hilly range, (south of Portage Lake,) to Huron Bay, and west of it to the Porcupine mountains, with the exception of a few moderately elevated hills, the country is undulating or rolling; there are, however, many deep ravines, and valleys of streams on this part, also tracts of level land. These lands are generally susceptible of cultivation, and, so far as they have been proved at the Missions near the head of Keewenaw Bay, and at the Ontonagon and Iron rivers, have been found to yield abundantly, in produce suitable for culture in this climate.

The climate, modified by this inland sea, has been found to be more mild than heretofore supposed, and no doubt now exists, but the agriculturist may be rewarded, on these lands, for his labor.

Over this entire tract, except where occupied by swamps or in some places on the Lake coast west of Keewenaw *Point,* the soil is generally a sandy loam, and the most loamy parts are in the valleys of the Sturgeon and Ontonagon rivers.

These lands are extensive and generally support a heavy growth of timber of sugar maple, birch, hemlock, pine, fir, cedar, lynn, ash, elm, spruce, &c. And it may be worthy of remark, that scattering pines of an excellent quality, may be found southeast of the hilly range of Keewenaw Point, and northeast of Portage Lake to the south boundary of township 57 north, range 30 west.

LAKE COAST AND HARBORS.

The Lake coast is generally bold and rocky, and though very irregular in its course, has few indentations of a character to form good harbors for vessels. The best and most convenient, are Copper, Agate and Eagle Harbors, situated on the north side of Keewenaw Point. (See map.) Also, a lea can generally be made south of a point on the east side Keewenaw Bay, T. 51 N., R. 32 W., and a vessel drawing 5 1-2 feet of water may enter the Ontonagon river, T. 52 N., R. 40 W.

RIVERS.

Upon this part of the district, there are three rivers navigable for small crafts, for a considerable distance into the country; they are the Portage, Sturgeon and Ontonagon rivers.

Sturgeon river has its source to the south of the head of Keewenaw Bay, in the hilly country, and runs northerly, nearly parallel to the west coast of this bay, and enters Portage Lake on section 33, T. 54 N., R. 33 W., and may be ascended with small boats into T. 52 N., R. 33 W. section 7; here its navigation is interrupted by drift wood which fills the channel for about 25 or 30 chains. This passed, which may be done by a good portage, the river may be ascended into T. 51 N., R. 34 W ;—but on account of a strong current in this part of the stream, setting poles or the best oarsmen are necessary, to effect an ascent to this point.

Portage river is about four miles in length, and the outlet of Portage Lake. It is a stream of considerable depth and breadth, and after passing the bar at its mouth, may be ascended with vessels drawing eight feet of water into Portage Lake, and thence to the head of this Lake near the south boundary of T. 56 N., R. 34 W., about 20 miles from the entrance at the mouth of Portage river. From the head of Portage Lake light boats ascend a small stream about one mile, and from thence by a portage of another mile over nearly level land enter Lake Superior.

Doubtless, at some future day, these two miles will be canaled, for the passage of larger crafts through this channel into Lake Superior.

The Ontonagon river is the largest stream on the south side of Lake Superior. This stream is navigable for batteaux in an ordinary stage of water, to the rapids, near the south boundary of T. 51 N., R. 39 W.

Near the mouth of this river, on the right bank, is an eligible site for a town, and when this harbor is improved, as it deserves to be, will probably become a place of considerable importance. There are other small streams on this part of the survey, the most important of which are, Eagle, Elm, Misery, Sleeping, Fire Steel and Iron rivers. These streams cannot be ascended far, even with canoes, on account of rapids or drift wood, but most of them form convenient harbors for small boats on the Lake coast.

PORCUPINE MOUNTAINS.

The third hilly range embraces the northerly portion of the Porcupine mountains, the easterly boundary of which commences on the coast of Lake Superior, three or four miles west of the mouth of Iron river, in T. 51 N., R. 42 W., thence runs nearly south to corner of sections 33 and 34, on south boundary of said township. Westward, these knobby mountains spread over the remaining part of the survey to the coast of Lake Superior, the highest elevations of which have an altitude probably of 950 feet, and the easterly hills have a more regular outline, than those of the westerly part, the latter in some places presenting cliffs and sloping ledges of great height.

These mountains, and the valleys between them, except near the Lake coast, or where occupied by rocks, have a good soil of sandy loam, which supports a heavy growth of timber of sugar maple, birch, lynn, hemlock, fir, elm, &c.

The Lake coast bordering these mountains is generally rocky, and affords no good harbors for small boats, except at Carp river. This stream runs W. S. W., nearly parallel to the coast of the Lake, for about ten miles, and at the distance of about two miles from the coast, it then bends to the northwest, and after passing falls and rapids near its mouth, enters Lake Superior on section 33, township 51 north, range 44 west.

GEOLOGY.

Within the boundaries of this survey there are five principal groups of rocks, which occupy large areas. They are, primary, trap, conglomerate, sandstone, and slates.

That group of rocks which may be denominated primary, and including the metamorphic rocks on the south, are found generally a little inland (except in the vicinity of Presque Isle Harbor,) from the coast of Lake Superior; and from the south boundary of township 48 north, ranges 25 and 26 west, into township 51 north, range 32 west, about three miles S. S. W. of the head of Huron Bay. (See map.)

These rocks make up a series of knobs and high conical hills, forming a broken range which has a course as near as could be determined W. S. W.

These elevations are of various heights, probably from 75 to 900 feet above Lake Superior, and, generally, the elevating force appears to have acted mostly upon their southeasterly sides, as this side generally presents cliffs and bold ledges, while their northwesterly sides slope away more gradually.

The metamorphic rocks alluded to, flank the primary rocks on the south, where the two become so much blended with each other as to make it difficult to define a line of junction between them. It may, however, be approximately drawn, commencing at the lower falls of Riviere Du Mort, or Nekomenon river, about one mile S. S. W. of Presque Isle Harbor, thence running W. N. W. to corner of sections 31 and 32, on south boundary of T. 49 N., R. 25 W., and curving a little westerly crosses the east boundary of T. 49 N., R. 27 W., near the corner of sections 25 and 36.

The principal rocks which compose the metamorphic group are quartz, compact, and granular, imperfect talcose slates, which are in some instances slightly argillaceous, and slaty hornblende. These rocks are more or less stratified and imperfectly jointed, and dip generally N. N. E.—In two instances, however, they were seen to dip S. S. W. A few veins of quartz were seen traversing these rocks, but no one was observed to *be metalliferous.* I have, however, seen specimens of specular iron ore said to have been obtained in township 48 north, range 26 west.

Within the boundaries of the metamorphic rocks upon the survey, several knobs of syenitic granite, and also dykes of greenstone were seen.

PRIMARY ROCKS.

That portion of this range which may be denominated primary rock, and lying to the north of the metamorphic rocks already described, is generally composed of granular quartz, feldspar, and hornblende, constituting a compact syenite. In some places slight traces of mica are observable, giving rise to a syenitic granite.

These minerals predominate in different proportion in different places, and not unfrequently in different parts of the same ledge or hill.

In some places it is mostly a hornblende rock, and in others the leading minerals are feldspar and hornblende, giving rise to a syenitic greenstone, and less frequently a well formed granite is found. In several instances a compact greenstone was found, intruded among these rocks in various forms. And when in veins or dykes, these do not appear to have any particular magnetic bearing.

One of these veins may be found of about one foot in thickness, traversing a ledge of syenite W. S. W., at 45 chains and 60 links in going west on south side of section 36, south boundary of T. 51 N., R. 28 W.

Throughout this entire group of rocks, quartz and feldspar veins are often found, and, in many instances, both are seen traversing the same rocks, and crossing each other at various angles. These veins are from a line to a foot or more in width, and were observed to be more frequent and of a larger size in townships 51 and 52 north, ranges 28 and 29 west, than in any other part of the primary range. Also a few veins containing calcareous spar were seen near the junction of the primary and sedimentary rocks.

In regard to the metalliferous character of any of the veins traversing the primary rocks, in this portion of the mineral region (so called,) it may be sufficient to say that no vein indicating a workable quantity of metal of any kind was observed; but it should not be inferred from this that they do not exist here.

My observations were mostly confined to township lines, which do not *always* pass over the most favorable places for examination, and afforded no opportunity of tracing up veins, that have some metalliferous indications, until their characters were developed.

ARGILLACEOUS SLATES.

Flanking the primary rocks already described on the northwest, in T. 51 N., R. 30, 31 and 32, W. argillaceous slates were found. They seldom crop out, and, on account of their being generally covered with a considerable depth of earth, their precise limits could not be defined. They are, however, supposed to occupy a space from one to two or more miles in breadth, before they are overlaid with the sandstone. These rocks have, generally, near their junction with the primary rock, a dip from 20 to 30 degrees to the N. or N. N. W. and their line of cleavage dips to the S. or S. E. making an angle with the line of deposition of about 65 degrees. These slates are generally of a dark brown color; but a curious variety was found in both branches of Huron river, on south boundary of T. 52 N., R. 30 W. section 36. Loose masses have been brought down these streams in abundance, some of which are varied with numerous stripes of red, *light gray, light* and dark brown, &c.

RED AND VARIEGATED SANDSTONE.

Flanking the slates already described, and resting upon them, red and variegated sandstones were found. These rocks extend north and west in nearly horizontal strata, passing Huron and Keewenaw Bays, and flank the base of the trap range of Keewenaw Point, on the southeast, throughout the survey. This sandstone also flanks the primary rock before described, on the north and northeast, to the coast of Lake Superior, except in the vicinity of Presque Isle. These rocks occupy a larger area on the survey than all the other rocks; they are generally laminated, and not unfrequently jointed, and vary considerably in the fineness of the materials of which they are composed, in different strata; and the whole are tolerably compact.

Though the strata of the sand rock may, in general, be considered horizontal, it has evidently been somewhat disturbed and contorted, and was observed in the vicinity of the northern slope of the primary and trap hills, to have a considerable dip from them.

This rock borders a large proportion of the Lake coast throughout this part of the survey, and may be seen, forming ledges from a few feet to 70 or 80 feet in height; and it should be mentioned, that novaculite, or at least a very fine grit for whetstones, may be found in a ledge on the east side of Keewenaw Bay, near its head, on section 35, T. 51 N., R. 33 W.

This ledge is laminated and jointed, and from it may be obtained whetstones of almost any degree of fineness. Also, to the S. S. W. of this ledge, on section 2, a good quality of reddish clay was seen, and at several other points on the bay coast, in this vicinity.

TRAP RANGE OF KEEWENAW POINT.

This range commences at the east end of Keewenaw Point, and has a course generally to the southwest, in a series of trap knobs and irregular hills, from three to seven or eight hundred feet in height above Lake Superior.

Their general topographical character and boundary have been already described. (See map.)

Generally, the middle and southeasterly side of this range is a compact greenstone, which gradually obtains an amygdaloidal structure, near the northwest slope; and, along this slope, in many places, a decided amygdaloid is found, the cavities of which are frequently filled with quartz, calcareous matter and epidote.

These characters of the trap rock are well sustained throughout this range on the survey. It has also been observed, that generally the slope of the trap rock has a much higher angle on the southeast, than on the northwest side of this range.

CONGLOMERATE ROCK.

This rock is of a great thickness, and flanks the trap range on the northwest side, from the east end of Keewenaw Point, westward, into township 57 north, range 33 west.

The conglomerate rock is made up of rounded pebbles and small boulders, principally derived from rocks of the trap family, and so firmly cemented together, that when broken, these rounded masses frequently divide through the middle. This rock does not appear to be very uniform in its dip; it may be estimated, however, to dip N. N. W., from 20 to 50 degrees.

Resting conformably upon the conglomerate rock, are *a series of alternating* strata of sandstone and conglomerate, embracing between their strata several trap dykes of considerable extent, which dip with these rocks to the N. N. W., at an angle of 30 to 40 degrees. The injection of these dykes has produced great changes in the rocks, by which they are embraced. The sandstone near the dyke is converted into an amygdaloid, and the character of the conglomerate much changed by igneous action. This is exemplified on the points of rocks, west of the entrance of Eagle Harbor, where they are severally seen.

These trap dykes may be seen at several other places, from Copper Harbor to a little west of the east boundary of T. 57 N., R. 33 west.

The conglomerate rocks above described, were not seen flanking the northwest side of the trap range of Keewenaw Point, southwest of township 57 N., R. 33 W., or between this and the Lake coast, until they were found on the northwest side of the Porcupine mountains. They are supposed to be wanting between these points, or they have diverged from the trap range, and occupy the bed of Lake Superior, which latter condition is deemed the most probable, as this direction best conforms to the strike of these rocks at both places.

VEINS AND VEINSTONE.

Between the east end of Keewenaw Point, and Portage Lake, the trap and conglomerate rocks are traversed by many well defined veins, at nearly right angles with the general course of the trap range, and at the surface of the rocks, these veins are from a mere line, to several feet in width.

The veins above alluded to, are generally nearly vertical in the rocks they traverse, and in some instances, they appear to have been fissures in the rock, and subsequently filled with veinstones, differing much in their character in different rocks.

In the greenstone and amygdaloid, these veins are usually made up of trap, more or less associated with quartz, and on their sides firmly blended with the rock which they traverse; but, in the conglomerate rocks, the veins are almost uniformly of calcarious matter.

Besides the well defined veins, above alluded to, there are others imperfectly formed, having a more diffusive character; also, at several points on the Lake coast, along the line of conglomerate rocks, veins of calcareous matter were seen, apparently embraced between their strata. These veins have a course nearly at right angles to the veins before alluded to, and are supposed to be of no very great extent.

Some of these veins at least are metalliferous through some portions of their course in the rocks which they traverse, and contain native copper and some of the ores of copper. Green and blue carbonate, and the black oxide, are thought to be the most abundant of the ores; and so far as I have been able to observe these veins, their metalliferous character is best developed along the line of junction of the trap and sedimentary rocks on *both sides* of the trap range.

The metalliferous character of these veins above described, have been most explored on the northeast side of Keewenaw Point, where some of them are now being worked, and much interest is felt by the enterprising proprietors of these works.

Thus far, several of these veins offer increased inducements to prosecute the work, and a few years of labor *will developе*, in some *good* degree, their true character.

That portion of the trap range of Keewenaw Point, extending southwest of Portage Lake, to the south boundary of the survey, has generally less width than that which has already been described, and the trap rocks do not so frequently crop out, consequently, its junction with the sedimentary rocks, could not often be seen. But the aberrations of the magnetic needle, (determined by the Solar Compass,) has always been found to be very great on or near the trap hills, by which means, it is believed, that its boundary on the township lines, where no out crop could be seen, has been very nearly defined. (See map.) But few veins are seen traversing the rocks on this part of the trap range, and no one observed to be metalliferous. Creditable reports, however, say, that copper veins have been found near the head waters of Elm river.

ARGILLACEOUS SLATES.

Argillaceous slates of a dark brown color, and slaty sandstone, are developed on a large scale in the bed and banks of Iron river, through township 51 north, range 42 west, three or four miles east of the Porcupine mountains. These slates are very variable in the direction and amount of their dip in different places. They vary from N. E. to S. E., and dip from 15 to 45 degrees in that direction.

These slates were also seen 50 or 60 chains east of Iron river, near corner of sections 25 and 36, and dipping E. N. E. about eleven degrees. From these facts it is reasonable to infer, that the slates dip under the sandstone, to the east of them, and that they extend west, to the base of the Porcupine mountains. But these slates, except in the streams before mentioned, are generally overlaid with a considerable depth of earth, and, therefore, their boundary could not be correctly defined.

Argillaceous slaty sandstone, somewhat similar to those already described, are found on the northeast side of the trap range of Keewenaw Point, on the east and south boundaries of township 53 north, range 36 west, (sections 25 and 33.) These slaty sandstones seldom crop out, consequently their limit was not ascertained. These rocks dip considerably to the northwest.

RED SANDSTONE.

Between the slates of Iron river and the trap range of Keewenaw Point, (except as above mentioned,) and south of the north half of T. 57 N., R. 33 W. and the Lake coast, to the south boundary of the survey, so far as known, the country is underlaid with red sandstone.

This rock frequently appears along the Lake coast, and in the beds and banks of streams and ravines The sandstone here is supposed to belong to the same formation of the red sandstone already described, east of the trap range of Keewenaw Point. Its general character is the same, except that in some places it contains more mica. This sandstone was observed to dip most near the trap range, in a N. N. W. direction, which dip diminishes to the coast of Lake Superior. A nicely stratified and jointed form of this rock, may be seen on the Lake coast at the south boundary of T. 55 N., R. 36 W.

TRAP AND CONGLOMERATE ROCKS OF THE PORCUPINE MOUNTAINS.

The remaining part of the survey embraces the northerly portion of the Porcupine Mountains, the boundaries of which have already been described. (See map.) These mountains are made up of a somewhat broken range of trap and conglomerate hills, having an estimated height from three to nine hundred and fifty feet above *Lake Superior.*

South of Carp river, (which runs nearly parallel to the

Lake coast,) and the south boundary of the survey, also the west half of T. 51 N., R. 42 W., embraces the trap rock within this part of the survey, which occupies an area of less than one township.

A large proportion of this trap is very compact, but in some places it is an amygdaloid, the cells of which are generally filled with calcareous matter or epidote. This trap, also, varies in color from a dark green or gray, to nearly a brick red.

To the northwest of the trap rock hills, and separated from them by the valley of Carp river, are two conglomerate hills, having a course nearly parallel to the Lake coast, from six to eight miles, the highest parts of which are estimated at 400 feet above Lake Superior.

These conglomerate rocks appear to belong to the same formation with the upper conglomerate of Keewenaw Point, having, like the latter, alternating strata of sandstone and conglomerate rocks, which dip to the N. N. W., at an angle from 25 to 45 degrees. A few veins of calcareous spar, were seen in these rocks at the Lake coast, on east boundary of T. 51 N., R. 43 W.; also, near the *lone* rock (so called) in T. 51 N., R. 44 W., but no one observed to be metalliferous.

It is, however, creditably reported, that copper veins have been found on this part of the survey.

DRIFT.

Numerous erratic boulders and other finer materials, are found spread over this region of country, apparently derived from the rocks which abound here, and from the region north of Lake Superior. Therefore, it is not uncommon to find transported blocks along the Lake coast, or in vallies of streams which contain copper or other interesting minerals. The relative position of the land and wat of Lake Superior, at some remote period of time, appears to have been quite different from their present state, as is evidenced by the effect of the Lake on the rock, and the form of the Lake bluffs, in many places some two hundred feet above its present level.

Thus far, a brief view of the geological condition of the various rock formations has been taken, leaving to the reader the pleasure of drawing his own conclusions as to the causes which have produced these geological effects, and also as to what may be deemed to be more or less valuable or interesting in this region of country.

In executing this part of the work, I have been much assisted by valuable instructions from our late and respected State Geologist, Dr. DOUGLASS HOUGHTON, who had this survey in charge, and from whom a critical geological report was expected.

In conclusion, it may be proper to remark, that in consequence of township lines being confined to distances of six miles apart, and to north and south and east and west courses, they frequently pass, for a long distance, over ground not the most favorable for geological examinations; also, supplies have to be furnished with packmen, instead of pack horses, in this region of country, and each man of a party on township lines, is under the necessity of performing his duties with a pack upon his back. But, notwithstanding these difficulties, it is believed that when experience shall have perfected this system of linear and geological surveys, it will be found the cheapest and the best yet devised for the public interest.

WILLIAM A. BURT,

Deputy Surveyor.

GENERAL OBSERVATIONS

UPON THE

GEOLOGY AND TOPOGRAPHY

OF THE DISTRICT

SOUTH OF LAKE SUPERIOR,

SUBDIVIDED IN 1845, UNDER THE DIRECTION OF

DOUGLASS HOUGHTON, Deputy Surveyor.

The subdivisions embrace the following townships which are fully completed, and the notes and maps thereof, are herewith returned.

Town 46 North, Ranges 24, 25 and 26 West.
" 47 " " 24, 25 and 26 "
" 48 " " 25 and 26 "
" 51 " " 32 and 33 "
" 52 " " 32 "
" 53 " " 32 and 33 "
" 54 " " 32 and 33 "
" 55 " " 31, 32, 33 and 34 "
" 56 " " 30, 31, 32, 33 and 34 "
" 57 " " 29, 30, 31, 32 and 33 "
" 58 " " 26, 27, 28, 30 and 31 "
" 59 " " 27, 28 and 30 "

The notes and maps of town 58 north, ranges 29 and 32 west, and town 59 north, range 29 west, were in possession of Dr. Houghton, and were lost with him.

For our present purpose, the above named towns may be arranged in two divisions, which, from their different geological features, will be separately considered.

In the first, will be included towns 46, 47 and 48 north, ranges 24, 25 and 26 west. In the second division, the towns upon the Keewenaw Peninsula. Towns 48, in ranges 25 and 26, and all those of our second division, are within the *town line survey* of the past season, and the general features of their topography and geology, are exhibited with great perspicuity and accuracy, in the report of Wm. A. Burt, Esq. accompanying the returns of his surveys. I shall, therefore, as far as possible, avoid repetition of facts which appear sufficiently detailed by him.

PRIMARY AND METAMORPHIC REGION.

Granite Rocks.

The portion of country included in our first division, which is occupied by these rocks, embraces towns 46 north, ranges 24, 25 and 26 west, together with most of the lower tier of sections in the towns adjoining on the north.

Throughout this region, the granite rocks make their appearance in a succession of rounded knobs, elevated from 20 to 100 feet above the surrounding country, and from 300 to 800 feet above the level of Lake Superior, and having a general range a little south of west, and north of east.

These rocks vary much in character and composition, being sometimes hornblendic, and approaching a perfect syenite, but more commonly feldspathic, or composed of quartz and feldspar, in which the latter mineral predominates. In the more southerly portion of the district, the feldspar is red, and gives a predominant color to the rock. Occasionally, the granite is traversed by quartz, in *irregular veins.* Some portions are massively stratified, the masses dipping to the north, or being nearly vertical. The knobs are rounded in outline, and are sometimes bare rock; but in general, they, in common with the surrounding country, are well timbered with spruce, hemlock, fir, birch, sugar maple, white pine and aspen. The soil is, in general, sandy, and second or third rate.

Plains of spruce pine occupy the more elevated portions of the district, embracing about one half or the central part of town 46, range 25, and, stretching northerly, include the southwesterly one fourth of town 47, range 25. This tract is destitute of streams, and the soil is very poor and sandy. The timber is chiefly an inferior spruce pine. These plains divide the waters flowing into Lake Superior on the N. and E., and Lake Michigan on the S.

This granite district is intercepted on the east by a belt of the red sandrock, hereafter alluded to, which occupies the tract between it and the Lake coast.

A little south of Presque Isle, granitic rocks make their appearance on the coast of the Lake, and westerly from Presque Isle, continue to occupy the projecting points for several miles, the red sandrock occupying the intervening bays. Knobs also of this rock, occupy the portion of town 48 north, range 25 west, lying north of Riviere Du Mort.

The granite of this portion of the country is traversed by large and irregular dykes of greenstone trap, and the granite itself puts on a trappose character, the two rocks being sometimes with difficulty distinguishable from each other. This is the commencement of an apparently very large extent of granite country, extending westerly into the region not yet surveyed by section lines.

These granites are important in an economical point of view, being so situated as to be easily quarried, and afford ing a great variety of very durable, as well as ornamental building stones. When we consider that the whole vast valley of the Mississippi to the south, is made up of secondary rocks, it seems probable that these granites will furnish a valuable article of commerce so soon as a more easy communication shall have been afforded between Lake Superior and the lower Lakes.

METAMORPHIC GROUP.

The rocks thus designated, occupy the country lying between the two granite regions above mentioned. The several portions of this district vary so much in the character of the prevailing rocks, as to call for seperate descriptions.

The more southerly, which I shall here denominate the *quartzite* portion, is composed of white and brown quartz rocks, talcose, augitic and clay slates, slaty hornblende, and specular and micaceous oxides of iron, and embraces the tract between the granites on the south, and a line bearing north of west from the mouth of Carp river, to the centre of the west line of T. 48 N., R. 26 W. This tract is rolling, with frequent ridges, having a direction nearly east and west, or bearing south of west, and elevated above the surrounding country from 40 to 150 feet. The greatest elevation above Lake Superior, as determined by the barometer, is 1001 feet. The timber is chiefly sugar maple, with some scattering pines, and other evergreens and birch.

The central portions of these ridges would seem to be trap, which is here capped, as well as flanked, by the metamorphosed rocks. Though no well characterized trap makes an outcrop, throughout this portion of the metamorphic region, the altered nature of the rocks plainly indicates the near approach of an igneous rock to the surface, and the dip of the rocks, though mainly north, at a high angle, exhibits a tendency in all directions from a central axis.

These rocks are throughout pervaded by the argillaceous red and micaceous oxides of iron, sometimes intimately disseminated, and sometimes in beds or veins. These are frequently of so great extent as almost to entitle them to be considered as *rocks*. The largest extent of iron ore noticed, is in town 47 north, range 26 west, near the corner of sections 29, 30, 31, 32. There are here two large beds or hills of ore, made up almost entirely of granulated, magnetic and specular iron, with small quantities of spathose and micaceous iron. The more northerly of these hills extend, in a direction nearly east and west, for at least one-fourth of a mile, and has a breadth little less than 1000 feet, the whole of which forms a single mass of ore, with occasional thin strata of imperfect chert and jasper, and dips north 10 degrees east, about 30 degrees. At its southerly outcrop the ore is exposed in a low cliff, above which the hill rises to the height of 20 to 30 feet above the country, on the south. The ore here exhibits a stratified or laminated structure, and breaks readily into sub-rhomboidal fragments, in such a manner as will greatly facilitate the operation of quarrying or mining the ore.

This bed of iron will compare, favorably, both for extent and quality, with any known in our country. The largest of the large ore beds of the state of New York, is estimated to be but 700 feet in breadth by 1000 in length.

A more extended and minute examination will probably determine this portion of the metamorphic group to contain other ores, less in amount, but which are generally esteemed more valuable.

The northerly portion of the metamorphic group of rocks, and which may here be denominated the *trappose* portion, embraces the whole remainder of the group north of the portion last described, except a small tract of country occupied exclusively by clay slate rock, and whose extent will be hereafter noticed.

This division of the metamorphic region is characterized by the frequent occurrence of knobs or uplifts of greenstone and augitic trap, making their appearance rather irregularly over the country, and surrounded by altered sandstones and slates. These uplifts are doubtless disconnected from any common centre or focus of eruption; but it is evident that rocks of igneous origin, form the base of all the rocky elevations of the region, and the surrounding altered and slaty rocks flank their sides and dip in all directions from them, the trap being protruded into a series of low knobs. Around the bases of these are the metamorphic rocks, consisting mostly of talcose, chlorite and clay slates. Quartz forms comparatively a small proportion of these rocks. The prevailing dip is northerly, about 80 degrees. Several of these knobs, in T. 48 N., R. 26 W., attain an elevation of 1058 feet above Lake Superior.

A hill of tolerably well defined granite makes an outcrop near the centre of this region, and in a low ridge, bearing in an easterly and westerly direction about two miles, but the granite is evidently of a trappose character. The hills of this region are generally timbered to their summits, and in many of them the rock does not come to the surface. The country is, in general, moderately rolling and beautiful. The timber is chiefly sugar maple, yellow birch, fir, hemlock and spruce, and the soil will, *without doubt, prove* fertile.

CLAY SLATE.

The rocks of the metamorphic group frequently graduate into clay slate, and it will be perceived, by reference to the map, that a well defined clay slate occupies a distinct tract in the region under consideration. This tract is almost wholly in T. 48 N., R. 26 W., and occupies an area of about five sections. The slate appears generally in low knobs, dipping northwesterly, and is highly argillaceous. The tract is timbered with a large growth of sugar maple and hemlock.

RED SANDROCK.

It will be perceived that this rock occupies a small portion of the country embraced in our first division. It is found skirting the primary and metamorphic rocks on all sides, and almost excluding them from the Lake coast.

As this rock occupies a larger area in the district of country, hereafter to be considered, no description of it will here be given. It may, however, simply be observed, that this rock is frequently found surrounding, and in contact with, the uplifted masses of igneous rocks, and is then invariably much altered both in appearance and texture, and may, under such circumstances, fairly be considered as metamorphic.

KEEWENAW POINT.

The subdivisions of the past season upon this part of the survey, include all that portion of Keewenaw Point lying north and east of Portage Lake, and this portion of the work will be separately considered.

Keewenaw Point may be said to be made up of three rock formations, trap, trap conglomerate and red sandrock. Of these, the first mainly gives its peculiar character to the country, giving to it its mountainous aspect and general configuration, having been protruded by the operation of igneous forces into its present position; while the other rocks are sedimentary in their origin, and are found surrounding and resting against the other.

The accompanying map will exhibit, with much accuracy, the positions and extent of these rocks, in reference to each other, and to the town and section lines.

TRAP ROCKS.

It will be seen that throughout nearly the whole of the portion occupied by these rocks, may be traced two distinct ranges of hills, which, commencing near the easterly extremity of the Point, run nearly parallel to the boundary of the trap. The summits of the more northerly range preserve an almost uniform distance from the northerly boundary of trap, of about one and a quarter miles, while those of the southerly range average little more than a half mile from the southerly extension of the trap formation. These ranges, which are quite continuous from T. 57 N., R. 28 W., westerly as far as T. 57 N., R. 32 W., begin here to fall away, becoming also more irregular and broken as they approach the basin of Portage Lake. In fact, from the latter town, southwesterly, their character, as distinct ranges, is almost entirely lost, until they reappear at about an equal distance from the Portage Lake, on the other side of the basin. The continuity of the trap rocks, however, is not destroyed, though its bounds are much narrowed.

The barometer work having been carried no further west from the extremity of the Point, than range 29, does not enable me to give the elevations of these ranges with completeness; but it may be stated that the highest point found is in the southerly range, in T. 58 N., R. 29 W., where the trap rises into a knob having an elevation above Lake Superior of 876 feet. To this knob has been given the name of Mt. Houghton. The general elevation of the northerly range of hills is, however, somewhat the greatest, the knobs rising to from 400 to 600 feet.

These ranges present their steepest escarpments on their southerly sides, where they rise frequently into cliffs of 100 feet nearly perpendicular, and, in one instance, in the southerly range, to nearly 400 feet. In general, they slope much more gently to the north, thus following the general inclination, or dip, which is common to all the rocks of the Point.

The portion of the trap district included between these two ranges, as far westerly as range 30, has a gradual descent into the valley of the Little Montreal river. Beyond this, westerly, it is more rolling and sometimes broken by knobs and ridges of trap, with some intervening swamps. The whole is, in general, covered by a sandy loam, and is clothed with an abundant growth of sugar maple, birch, fir, oak and white pine; the maple greatly predominating, wherever the soil is of sufficient depth. Where this soil is barely sufficient to conceal the underlying rock, cedar is the prevailing timber.

It will be observed that the Little Montreal river, above alluded to, has its course wholly between these two trap ranges, pursuing its course nearly across ranges 30, 29 and 28. This is the most considerable stream in the district under consideration. Though somewhat sluggish through the first half of its course, which may be said to occupy the most elevated part, or plateau, of the trap region, it becomes more rapid through ranges 29 and 28, and its course to the Lake shows a very considerable descent, probably of about 300 feet, through the latter range.

The more northerly of these ranges of trap is very uniform in character, and while the rock of both the northerly and southerly ranges may be denominated greenstone, that of the latter is much the most compact. The rocks of the former range have a very distinctly chrystaline structure, passing from a very granulated greenstone to a rock composed of crystals of augite, or hornblende, and feldspar, with considerable intermixture of quartz, sometimes nearly forming an imperfect syenitic granite, and showing the identity of origin of the trap and granite rocks. These portions of the trap are extremely hard, and break with difficulty under the hammer.

The central portion of the more elevated knobs of the southerly range are frequently composed of a very hard and compact trap of a reddish color, which sometimes takes on the character of a trap breccia, or aggregate of small cemented angular pieces of rock, and may perhaps be denominated a trap porphyry.

Intermediate between these two ranges the trap is sometimes compact, at others amygdaloidal, and, occasionally granular; while, on the outer slopes of both ranges, it is almost uniformly amygdaloidal, and is frequently what may be denominated a true amygdaloid, having its cells filled with spar, quartz, epidote, and other minerals.

In an economical point of view, the greenstone of the trap range is worthy of consideration, being well fitted for use as a building material, from its durability, and the ease with which, in consequence of its jointed structure, it may be quarried.

CONGLOMERATE ROCK.

Resting against the trap on its northerly slope, and extending from the extremity of Keewenaw Point westerly into T. 57 N., R. 33 W., will be found a rock formation which is evidently of sedimentary origin, being composed *of water worn masses,* generally of the harder portions of the trap rocks, held together by an exceedingly hard calcareous and argillaceous cement. It is evident that this rock was deposited around the base of the trap hills, beneath the waters, and has been subsequently elevated, for the whole mass dips northerly, or from the trap hills, at an angle of about 45 degrees.

At or near its junction with the trap, this rock rises into a very distinct and generally continuous hilly range; which may, in fact, be considered as the outcropping edge of the formation, rising on its northerly side in a steep escarpment, but sloping more gradually down towards the Lake, on the north. This ridge varies in elevation, the highest ascertained point being in T. 58 N., R. 27 W., and is 680 feet above Lake Superior. But this is much above the average elevation, which will not be found probably to exceed 350 feet.

A marked difference is observable in the character of the country occupied by the trap and conglomerate rocks; for, while the former exhibits a series of elevated knobs of a rugged and broken character, the latter presents a more uniform and rounded outline, and cedar, fir, and other evergreens, constitute a larger proportion of its timber.

MIXED CONGLOMERATE AND SANDROCK.

At a short distance northerly from the range last mentioned, may be observed another, but less elevated and continuous ridge, which is the southerly outcrop of the mixed conglomerate and sandstone formation. This rock may, in fact, be considered as an upper member merely of the conglomerate, and differs from it only in being composed of alternating strata of coarse or fine materials, derived from the same origin. As the finer strata of this rock have been mistaken by some for the red sandrock, hereafter described, it is important to observe that a very marked difference exists between the two rocks; for, while the latter is made up of materials derived from the several rock formations of the country, and into which quartzose grains enter most largely, the former is wholly derived from the trap rocks.

This conglomerate and sandrock range probably nowhere exceeds 350 feet above the level of the Lake. It occupies the northern coast of Keewenaw Point, with some exceptions occasioned by trap dykes, within the limits alluded to as the extent, easterly and westerly, of the conglomerate rock formation.

In the hollow between these two ridges of conglomerate, and conglomerate and sandrock, lie several long and narrow lakes, and lines of swampy ground are not an uncommon feature.

The barometer work having been carried over a comparatively small portion of the Point, I have not been able to form any new estimate of the thickness of the conglomerate and mixed rocks. Those contained in the report of Dr. Houghton, made to the Legislature of Michigan in 1841, may be considered as sufficiently precise, which fix the maximum of the latter at 4200 feet, the former having probably a less thickness on the Point, though attaining near the Montreal river a thickness of 5260 feet.

TRAP DYKES.

I have already alluded to the fact that the granites of the more northerly portion of the primary district are traversed by dykes of trap, which have produced great changes in the rocks of that district, as also to the fact that the conglomerate and sandrocks are found traversed by similar dykes. On approaching Keewenaw Point, *from the eastward*, trap is seen apparently interstratified with the conglomerate and mixed rocks which constitute the coast, the whole dipping together to the north at an angle varying from 30 to 45 degrees.

A trap dyke of very unusual size makes its appearance on the eastern extremity of the Point, in section 10, and may be traced westerly, following the general curvature of the coast, into range 31 west. It has an average breadth of half a mile. In its westerly prolongation, this dyke first approaches the coast at Copper Harbor. It has here been broken across by the waters of the Lake; so that, while the conglomerate rocks are found composing the outer points, as well as the south side of the harbor, the trap is seen at its two ends and at the projecting points and islands, and it forms the bar across the entrance.

Continuing westerly, this dyke cuts entirely across the conglomerates and sandrocks, at Agate Harbor, and from thence the coast is constituted of this rock, westerly as far as section 3, in T. 58 N., R. 31 W. Along this portion of its course it is found gradually thinning out, having at Grand Marais and Eagle Harbors a width of a few rods only, and thinning out entirely, or passing off into the deep water of the Lake, at the point above named.

The trap composing this dyke is partly compact and partly of amygdaloidal structure. At Agate Harbor, the trap is of this latter character, and the cells are filled with chalcedony, cornelian, jasper, quartz, &c., often forming agates of great size and beauty. This part of the coast is lined with islands at a few rods distance from the main shore, most of which appear to be portions of trap of a more hard and compact character, and which have resisted the action of the waters that have washed away the intermediate portions, thus forming a series of narrow and deep channels.

This dyke dips regularly with the conglomerate and sandrock in which it is included, to the north and north-west, at an angle of about 45 degrees.

RED SANDROCK.

This rock, the equivalent of the Potsdam red sandrock of the New York reports, it will be seen by the map, occupies the whole remainder of the portion of Keewenaw Point under consideration, skirting a large part of the trap range, on both sides, but having by far its broadest extension on the south side. It here lies in nearly horizontal strata, though at the coast a slight dip inland is observable, becoming more apparent as it approaches the basin of Portage Lake. In its approach to the trap, however, it is found more or less tilted from its original horizontal position, and is also very much altered by its contact with that igneous rock. The evidences both of the deposition of this extensive formation, in calm and shallow waters, and of the subsequent change induced in it by the trap rocks, when in a fused or heated state, are very apparent.

Receding from the trap ranges southward, the surface of the country underlaid by this rock is, in general, rolling, and timbered with sugar maple, hemlock, birch, spruce, fir and occasional large pines. The soil is a sandy loam, and, in general, of good quality. Approaching the Lake coast, the land falls gradually to a level, where the evergreens predominate over the maple, and the country is much cut up by marshes.

MINERAL VEINS.

In regard to this subject, I have deemed it unnecessary to enter into details, for the reason that the returns of the surveys, so far as the geology is concerned, relate rather to the general character of the region, and that the observations of the past season, so far as can now be determined, tend to confirm the facts which have been stated with considerable minuteness of detail, in the report made by Dr. Houghton, in 1841, to the Legislature of the state of Michigan.

It may, however, be observed, that the courses of many veins have been fixed with accuracy, and the veins themselves traced, in some instances, for several miles across the conglomerate and sandrocks, and into and across some portions of the trap. The observations thus made, are confirmatory of the fact first noted by Dr. Houghton, that the true veins of the district referred to, pursue a course nearly at right angles to the line of bearing of the trap range.

In concluding these brief descriptions, it may be proper to state, that the personal observations of the writer have been confined almost entirely to a somewhat cursory exploration, made several years ago, while acting as assistant to Dr. Houghton, in his arduous labors in the geological commission of Michigan, and that he has been enabled to devote but a very limited time to the examination of the specimens collected, and of the notes returned. It is very probable, that he may have omitted many facts of importance. It is only by special solicitation, and the apparent necessity of the case, that he has undertaken to prepare such general observations as seemed called for under present circumstances.

In attempting this duty, the undersigned cannot be unmindful of the very meagre and imperfect sketch here presented, when compared with whatever proceeded from that master mind, whose genius first developed, and whose indomitable energy tracked through all its difficulties, a system not only intricate in itself, but novel to science, and in a region at that time destitute of all the ordinary facilities for scientific investigation. To the same active and philosophic mind, we owe the system of the union of geological with the lineal surveys of lands of the United States, the first experimental results of which are now returned to this department.

In presenting these, it may not be deemed inappropriate to allude to the general advantages resulting from the new system, as devised, and thus far successfully prosecuted, by Dr. Houghton.

The advantages of thorough geological and topographical surveys, are now so well appreciated, that they have been prosecuted to a considerable extent by foreign governments. Great Britain has already appropriated immense sums towards the accomplishment of a complete survey of that kingdom, which has as yet advanced but a comparatively little way. And the geological surveys made by the United States, have made very fully and generally known the advantages of these undertakings. Fortunately, the system of rectangular surveying, adopted by the United States government, affords the best possible opportunity to accomplish, with little additional expense, what, under other circumstances, could be effected only at a much more considerable cost. The maps, both geological and topographical, herewith returned, will afford some evidence of the extreme accuracy, as well as extent and minuteness of the results thus obtained.

In noticing some of the scientific results of the survey of the past season, the duty would be imperfectly performed, were I to omit calling attention to the unwonted accuracy with which the lines have been run. This accuracy has been attained by the exclusive use, by all the parties, of "Burt's Solar Compass," an instrument too well known to need more than a bare allusion, but the great value of which has been more than fully confirmed during the surveys of the past season. This remark will seem justified, when it is considered that nearly the whole region of country traversed by these surveys abounds with mineral attractive to the magnet; that the needle has been almost constantly acted upon by causes which produced deviations from the true meridian of the earth's magnetism, and often so powerfully as to completely reverse the direction of its poles. A variation fluctuating from 6° to 20° on either side of the true meridian, was not uncommon, through the length of an entire township; and it seems difficult to imagine how the lines could have been run with the ordinary surveyor's compass. Other important advantages have been arrived at, from the use of this compass, of both a scientific and practical character; one of which only, will be here alluded to, viz: the means afforded by it of detecting the presence of certain rocks, over large areas, where no rocks are visible at the surface. This was particularly observable in the region of the great trap ranges, where it was almost uniformly found that the needle became deflected towards the mass of the trap hills, even though distant, and was more or less fluctuating, when passing over a country whose underlying rock was trap. The same phenomena were exhibited among the iron ore rocks of the metamorphic region.

Allusion may here be made to the increased importance given to the work of the past season, by the introduction of the barometer upon the lines, by means of which, the elevations of the country are exhibited with a great degree of accuracy; a complete section being obtained on every line, and thus furnishing all that was needed to make a true, complete and minute exhibit of the topography of the country. In another and more scientific point of view, the use of this instrument becomes highly important, from the means it affords of ascertaining the true dip and thickness of rocks; data, the importance of which are appreciated not merely by the man of science, but, as is well known, in the practical operations more especially of the miner and engineer.

It may be allowed me, further, to allude to the commendable zeal and fidelity which has been exhibited by all those who have been associated with Dr. Houghton, as his aids, during these surveys, in furthering the plans marked out by him, and by their numerous and close observations, assisting to perfect the knowledge of the geology of that interesting region.

BELA HUBBARD.

Section illustrative of the order of super-position of the Rocks of the Upper Peninsula.

9.	Tertiary Clays and Sands.	Thickness in feet.
8.	Upper Limerock Group, (embracing as members, the Drummond Island and Mackinaw Limestones.)	
7.	Lower Limerock and Shales.	
6.	Sandy or Intermediate Limestone.	
5.	Upper Grey Sandstone,	mean 700 ft.
4.	Lower or Red Sandrock and Shales,	extreme 6,500.
3.	Mixed Conglomerate and Sandrock,	extreme 4,200.
2.	Conglomerate rock,	extreme 5,260.
1.	Metamorphic, Trap and Primary rocks.	

MINERALS AND MINERAL VEINS.

[*From Dr. Houghton's Report of* 1841.]

In considering this portion of the subject, I propose to treat the minerals of the different formations separately, so far as the same can be done, and although this method will necessarily cause some repetition, it will enable me to show, more perfectly than could otherwise be done, the connection between those minerals that may be regarded as of practical value, and the rocks to which they belong.

As a whole, the rocks of the upper peninsula are deficient in *number* of minerals, though some few individual *species* occur abundantly.

MINERALS OF THE PRIMARY ROCKS.

The following list can by no means be regarded as perfect, but it will serve, at least, to convey an idea of the small number of minerals which are found in connection with the rocks of this group.

Schorl,
Tourmaline,
Hornblende,
Actynolite,
Mica,
Feldspar,
" red,
Quartz.

MINERALS OF THE METAMORPHIC GROUP OF ROCKS.

Quartz, common,
" milky,
" greasy,
" tabular,
Serpentine, common,
Iron, scaly red oxid of,
" hæmatite,
" pyritous,
Steatite,
Novaculite.

Of the minerals enumerated as occurring in the metamorphic rocks, the milky variety of quartz is abundant, sometimes composing almost entire ranges of hills. The novaculite is also abundant, but of a coarse variety. This last is associated with the talcose slates. The remaining minerals appear either disseminated, or forming druses in the quartz rock, though sometimes they occur in thin beds or veins, in the talcose slate, which beds conform to the line or cleavage of that rock. Although the hæmatite is abundantly disseminated through all the rocks of the metamorphic group, it does not appear in sufficient quantity, at any one point that has been examined, to be of practical importance.

MINERALS OF THE TRAP ROCKS.

Quartz, common,
" smoky,
" milky,
" greasy,
" radiated,
" mamillary,
" drusy,
" amethystine,
Chalcedony,
Cornelian,
Jasper,
Agate, common,
" fortification,
Augite,
Actynolite,
Serpentine,
" pseudomorphous,
Chlorite, common,
" earthy,
Analcime,
Harmotome,
Heulandite,

Steatite, common,
Asbestus,
Amianthus,
Calcareous spar,
Copper, native,
" pyritous,
" black,
" red oxid of,
" azure carbonate of,
" green carbonate of
" " " ferruginous.
Lead, sulphuret of,
" carbonate of,
Iron, pyritous,
" red oxid of,
" hydrate of,
" silicate of,
Manganese, ferruginous oxid of,
Silver, native, (very rare,)
Stilbite,
Laumonite,
Prehnite.

Since a consideration of the minerals contained in the trap, will also involve a portion of those embraced in the conglomerate, the mixed rock, and red sandrock and shales, I will, before referring minutely to those of the trap rocks, lay before you a list of those which occur most frequently in the sedimentary rocks last mentioned. The fact that veins of mineral matter, traversing the trap, are frequently continued across the several sedimentary rocks, and that dykes are of frequent occurrence in these latter rocks, would lead to the inference that there would be a considerable degree of resemblance in the character of the minerals embraced in these dykes and veins, in both the trap and sedimentary rocks, and to a certain extent, this inference would be true; but it should be borne in mind, as has already been stated, that the veins, in traversing the several upper rocks, undergo very great changes in mineral character.

MINERALS OF THE CONGLOMERATE, MIXED ROCK AND RED SAND-ROCK.

Calcareous spar,
Quartz, common,
“ milky,
“ drusy,
Chalcedony,*
Cornelian,*
Jasper,*
Agate,*

Copper, native,†
“ pyritous,†
“ blue carb. of,†
“ green carb. of.†
“ earthy green carb. of,†
“ black,†
Zinc, siliceous oxid of,
“ carbonate of,

Iron, pyritous,
“ black oxid of, (cemented iron sand,)
“ red oxid of,
“ hydrate of,
“ silicate of,

*Occasionally occurring among the pebbles constituting the mass of the conglomerate.

†Chiefly in those portions of the veins traversing the conglomerate.

MINERAL VEINS OF THE TRAP, CONGLOMERATE, &c.

In order to render the subject of the mineral veins traversing the above rock, so far intelligible as may be in my power, I have already been particular to define, as far as could be done without maps and sections, the relation which the trap rocks, together with the superincumbent conglomerate, mixed sand and conglomerate and red sandrock bear to each other, and it will be necessary, in considering the mineral contents of these rocks and the veins traversing them, to keep this relation constantly and clearly in view.

It will be recollected, that the northwesterly range of hills, commencing at the extremity of Keewenaw Point, and stretching from thence in a southwesterly direction into the interior, were referred to as being more clearly of trappose origin than either of the other ranges, and that the rock of the southerly portion of this range is either compact greenstone or altered syenite, while that of the northerly flank is almost invariably either an amygdaloid or a rock approaching to toadstone.

The several ranges of hills to the south of that last alluded to, are either well formed, compact greenstones, altered syenite, or, (as we approach the primary range,) imperfectly formed granites. So far as the several ranges of hills, lying south from the northerly range, are concerned, they would appear to be, as a whole, deficient in minerals, and the rocks are not apparently traversed by veins or dykes of any more recent date than that of the uplift of the northerly trap hills.

Veins clearly of a date posterior to the uplift of that portion of the trap rock last mentioned, are of frequent occurrence, and these veins not only traverse a portion of the trap range, but also pass into the conglomerate, and sometimes completely across the three sedimentary rocks, immediately above the trap, thus having an unbroken length of several miles. The class of veins to which I now allude, where they occur in a connected or continuous portion of the range, rarely vary more than 12° to 15° from a right angle to the line of bearing of the sedimentary rocks, and in pursuing this course, they necessarily cut across the dykes of trap before alluded to as so frequently appearing between the strata, and conforming to the dip of the lower sedimentary rocks.

That the veins under consideration belong to a single epoch, is inferred from the fact, that none have been noticed with other veins crossing them, as also for the reason that none have ever been noticed with dislocations, heaves or disturbance of any kind, save what may be referred to causes connected with their immediate origin.

That these veins must be regarded in the strictest sense as true veins, cannot be doubted, and that their origin or source, over the extended district alluded to, has been the same, is inferred from the perfect identity of their mineral contents; for a description of one of these true veins may be said to be essentially a description of the whole. Thus, while the mineral contents of the different portions of the same vein change as the rock traversed changes, the corresponding portions of different veins almost invariably bear a striking and close resemblance to each other.

These veins, as has already been stated, where they traverse connected ranges of the trap, are regular in course and direction, but when they are connected with a single uplifted knob of that rock, they are irregular and can scarcely be defined, appearing, in the latter instance, rather as matter injected into the fissures of a shattered mass of rock, than as connected veins.

The importance of carefully studying the relation which these veins bear to the rocks which they traverse, as also the relation which they bear to the numerous trap dykes, together with the few cotemporaneous veins noticed in the trap, is very much increased by the circumstance, that these veins are more or less connected with, or rather contain, metallic materials, which, it may be fairly inferred will hereafter become of very considerable practical importance. In fact, so far as we may be enabled to judge from the examinations already made in this district of country, it is confidently believed that most, if not all the metalliferous veins of the upper peninsula belong to veins of the epoch of those under consideration. It is true that native metals, more particularly copper, are sometimes found, in place, occupying the joints of natural septæ of greenstone, but in these instances, the amount of metal is always comparatively small, and, with one or two exceptions, I have invariably been able to establish some connection between the native metal occupying these joints and the termination of some metalliferous vein that traverses other portions of the rock not far distant, and it is believed that the metal filling these joints has invariably resulted from the action of causes precisely analogous to those which have placed similar metals in the veins to which I have alluded.

The earliest as well as all travellers, who have visited the district of country under consideration, have not failed to make frequent allusion to the loose masses of native copper that have been occasionally found scattered over it, nor has any one failed to allude to the large bowlder or loose mass of that metal upon the Ontonagon river. Almost invariably, the opinion has been expressed, from the frequent occurrence of these masses, that the metal must be abundant in the country. But, after all, the true sources from which these masses had their origin, or the relation which they held to the rocks of the district, would appear never to have been understood; and all, or nearly all, that was known of their true relations, was left to conjecture. The result of this has been, that while some have excessively magnified every thing connected with a subject of which, in truth, nothing was known, another class, equally far from what is really true, have regarded these masses of native copper as bowlders transported from high northern latitudes.*

As far back as 1831 and 1832, I had occasion to pass, no less than three times, along the south coast of Lake Superior, as also to ascend several of the important tributaries of that Lake, and during these years, I passed by three different routes, widely separated from each other, completely across to the Mississippi river. It is true that these journeys, made through a complete wilderness, uninhabited except by savages, were necessarily made under circumstances that admitted of only very general observations; but the result of these previous examinations have proved of immense service to me, in aiding the labors of the past season. I allude to these journeys and examinations at this time, in order to show you the difficulties by which a full understanding of the subject under consideration is surrounded, for I became satisfied at that time, not only that the subject was not understood by the mass of those who had traversed the country, but that even the natives of the country had no knowledge of the true sources from which the transported masses of copper had their origin.

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* The vast area of country over which the bowlders of native copper, from the district under consideration, (together with its westerly prolongation,) have been transported, is worthy of remark. They are not of unfrequent occurrence in the sand and gravel of the southern peninsula of Michigan, and since the commencement of the geological survey, many of these masses have been met, some of which weigh from seven to eight pounds. In the vicinity of Green Bay, a mass was discovered, some ten years ago, which weighed 140 pounds, if my memory serves me correctly. Loose masses, of a similar character, have been met with in various other portions of Wisconsin, as also at various points in Illinois, Indiana and Ohio. In these cases, the occurrence of these masses of native copper are no more indications of the existence of veins of the metal in the immediate vicinity, than are the immense numbers of primary bowlders scattered over the southern peninsula of Michigan, indications of the existence of primary rock *in place*, in the district where they are found.

During the time of the examinations alluded to, a bare glimmer of light was thrown upon the subject by an examination of some small masses of copper, found occupying the joints of the greenstone; as also by the examination of a single vein in the conglomerate, containing the ores of copper, which has since been found to be the termination of a vein that is somewhat obscurely continued from the trap region. While these examinations were sufficient to enable me to draw the inference that the masses of native copper came chiefly, if not wholly, from the trap, and more rarely from those sedimentary rocks resting immediately upon it, it was supposed that this occurrence would follow the general law, and that it, together with the other ores of the metal, would occur in greatest abundance near the line of junction of this rock, with the overlaying sedimentary rocks. Nothing, or at least very little, was known of the true extent or range of the trap rocks, and the very great inaccuracies in the published maps of the country, rendered it almost impossible to apply even the data on hand to such purpose as to relieve the embarrassment.

With a full knowledge of these difficulties, I determined, during the past season, to endeavor to surmount them by so far adding to our geographical knowledge of the coast of the Lake and its immediate vicinity, as to enable me to place whatever geological observations of importance might be made, in such condition that the relations of the several parts might be understood. Having sufficiently accomplished this, I proceeded to a very minute examination of the several rocks overlaying or resting against the trap, together with a determination of the thickness of the several members, and their rate of decrease or wedging to the east. With these data, I was enabled, by noting the dip of the rock upon the coast, to determine, with sufficient accuracy for the purposes to which the rule was to be applied, the line of junction between the trap and conglomerate rocks. This rule, when put in practice, enabled me to decide, with a very considerable degree of certainty, this line of junction, when the rocks were covered with a very considerable thickness of detrital matter; and when so covered, I was enabled, by traversing the country, on the line of bearing of the upper rocks, the more readily to gain access to such points as would admit of examination.

These observations soon showed me that this line of junction between the trap rock and the south edge of the conglomerate, instead of pursuing a course parallel to the coast, only continued its parallelism for a few miles westerly from the extremity of Keewenaw Point, after which, for a long distance, it recedes from the coast rapidly. These facts served to explain in part, why the subject of the origin of the masses of copper had remained a mystery, for the country through which this line passes, is hardly ever passed over, even by the Indians, and probably large portions of it have never been passed over by the whites; but *in addition to this,* the obscure character of the metalliferous veins is such, that they would scarcely attract the observation of the traveller whose attention was not called especially to the subject; for many of the richest ores are so far from having the appearance of the pure metal, that they would be the last suspected to contain it in any form.

That the connection of these ores with the containing rocks was not understood by the English mining company, whose attention was turned to this subject at an early day, is to be inferred from the fact, that they commenced their operations at Miners' river, where the rock is the upper or grey sandstone, which has never been observed to contain mineral veins; and, also, on Ontonagon river, near the mass of native copper, at which point a shaft was commenced and carried about forty feet through a reddish clay, at which point the red sandrock was reached. Now, although the metalliferous veins sometimes pass from the trap across the red sandstone, these veins in the red sandrock have never been noticed to contain any other ores than those of zinc and iron, unless it be at the immediate point where the vein crossing comes in contact with a dyke of trap, which condition does not exist at the point alluded to, on Ontonagon river. What indications could have induced these Quixotic trials at the points where they were commenced, is more than I have been able to divine, and as might have been anticipated, the attempts resulted in a failure to find the object sought.

Having thus, in a general manner, set forth the obscurity by which the subject of the true source of the transported masses of native copper has been surrounded, together with some of the reasons which have served to prevent its being fairly understood, I will now proceed to a general sketch of the metalliferous veins of the district, so far as the same have been examined; premising, that our knowledge of them is still deficient in very many important particulars, which can only be supplied by a careful and continued examination of the subject, which, in fact, can only be said to be but just commenced.

I have had occasion to refer to the outer or northerly range of hills, or those from which the metalliferous veins may be said to spring, as being composed of trap rock, and lest what has been said may not be fairly understood, I will repeat, that the more southerly part of the range is uniformly composed of compact greenstone, under which head I not only include true greenstone, but also those forms of altered granular gneiss and gneissoid granite, which sometimes are associated with it, while the outer or northerly portion of the same range is usually composed of an amygdaloidal form of trap. The cells of the amygdaloid are usually filled with the different varieties of quartz, cornelian, chalcedony and agate, and sometimes, though more rarely, with native copper, or with calcareous spar, though they are sometimes entirely empty, constituting a perfect toadstone.

The metalliferous veins cross this range of trap, usually very nearly at right angles to the prolongation of the hills, and are frequently continued in the same course, across the upper or sedimentary rocks, thus crossing the latter at an angle varying but little from their line of bearing.—While the continuity, of course, of the vein, may remain perfect in its complete passage from the greenstone across the several members of the conglomerate, mixed and red sandstone rocks, the character and mineral contents of the vein undergoes essential change, and not only does the vein appear to be influenced in its mineral contents, but also in its width, for, as a general rule, the width of the *vein increases* as we proceed northerly, or from the greenstone. Thus, a vein which may appear of only a few inches in width, or as a bare line in the southerly or greenstone portion of the range, increases in width rapidly as it approaches and passes across the amygdaloid, and at or near the line of junction between the amygdaloid and the sedimentary rocks, it will frequently be found to have attained a thickness of several feet, while in its passage across the sedimentary rocks it is usually either still further increased in width, or becomes so blended with the rock itself, as to render it difficult to define its boundaries.

These metalliferous veins, like those which occur under similar circumstances in other portions of the globe, do not continue uninterruptedly of any given width, for great distances, nor is their width increased regularly, for they frequently ramify or branch off in strings, that pursue a course generally somewhat parallel to the general direction of the main vein, and which eventually again unite with it. Sometimes these ramifications or branches destroy, as it were, for a considerable distance, the whole vein; but they at length unite again, and the main vein is, after their junction, as perfectly developed as before.

While traversing the most compact, southerly portion of the greenstone, the veins are most frequently made up of a very compact and finely granulated geenstone, sometimes associated with steatitic minerals and silicate of iron, under which circumstances they usually are destitute of any other metallic mineral, but occasionally, instead of the materials above mentioned, their place is supplied by native copper, without veinstone or matrix, and usually free from nearly all earthy impurities, but almost invariably incrusted with oxid, or carbonate of the metal. Those portions of the vein traversing the greenstone, in which native copper occurs, under the circumstances above mentioned, are invariably thin, rarely exceeding three or four inches in thickness, and usually considerably less, and they are liable to very considerable variation in width, from the divergence caused by the vein traversing the joints of the rock, where these joints produce the same character of change as is produced by the ordinary ramification of a vein.

As these metalliferous veins traverse the northerly portion of the range, or approach the sedimentary rocks, they undergo a gradual change in width as well as in mineral character, and it has been noticed that where the amygdaloid is most largely developed, the vein, as a general rule, has not only a greater width, but also has its mineral contents more perfectly developed; a circumstance which might fairly have been inferred from the fact that those points where the amygdaloid occurs most largely, may be regarded to have been so many centres of intensity of action, at the time of the original uplift of the range, from which circumstance they would remain in a softened state, or in such condition as to admit of the more perfect formation of these cross veins for a longer space of time after that condition had been passed at other points.

In the outer or amygdaloid portion of the rock, the vein is almost invariably accompanied by a veinstone of quartz, involving all the varieties before mentioned, as associated with the trap rocks, which quartz, though occasionally it occurs massive, of several feet in width, usually appears in the shape of a series of irregular ramifying and branching minor veins, that may be said to constitute the main vein. These subordinate veins of quartz, which may be stated as the true veinstone, vary from a mere line to several inches in thickness, and in the aggregate they may *be said* to constitute from one-third to one-half the total thickness of the vein. In their branches and ramifications, they sometimes include portions of the rock which they traverse, at other times they embrace imperfectly formed steatite, with silicate, carbonate and red oxid of iron,[*] and occasionally, though more rarely, it is associated with carbonate of lime, usually assuming the form of an opaque rhombic spar.

As the main vein traverses the conglomerate and overlaying rocks to, and including the red sandstone, these veins, as a general rule, undergo still farther changes, for very soon after entering the conglomerate, the veinstone changes from its quartzose character, and is made up, either wholly, of calcareous matter, mostly rhomb spar, or of this mineral, with occasional ramifications of quartz. The whole usually including, and sometimes investing fragments of the conglomerate or the pebbles of that rock, separated.

As the vein is continued still farther in the direction of and into the red sandstone, these changes are still noticed, and eventually the vein is found to be composed either entirely or mostly of calcareous spar, and eventually so completely is its metalliferous character lost, that it would not, if examined singly, be suspected to be any portion of a metalliferous vein.

The metalliferous character of these veins is most largely developed almost directly at or near the line of junction of the trap and sedimentary rocks, and they rarely continue, without considerable change, for a greater distance than one-fourth to one-third of a mile, on either side of the line, though a few veins were noticed in which, in the southerly or trap extension, the character of the vein continued for a distance of over a mile, nearly unchanged, while in its passage through the conglomerate, for half that distance, its character was also perfectly preserved.

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[*] The latter closely resembling the Gossan, of the Cornish miners.

The mineral character of the veins is somewhat varied in those having different degrees of thickness, though it is difficult, if not impossible, to lay down any rule which would characterize this change. The different veins vary very greatly in width, ranging from a mere line to 14 or 15 feet, the greatest observed width of any single vein.

In the descriptions of the veins given above, I only intend to include those which are most perfectly developed; for, in addition to these, there are also many which are imperfectly formed and short, and in which many of the above characters are in part or entirely wanting. These latter are usually of little practical importance, and thus far have been comparatively little examined.

Of the metallic minerals occurring in those portions of the *true* veins which traverse the trap rocks, together with that portion of the conglomerate immediately resting upon or against the trap, by far the most important consists of the several ores of copper, with which iron occurs disseminated in the forms before described, and occasionally, though very rarely, native silver has been detected, associated in the same vein. After as minute an examination of the subject, as the circumstances will permit, I am led to the conclusion, that the only ores of the metallic minerals, occurring in those portions of the veins, which traverse the rocks last alluded to, which can reasonably be hoped to be turned to practical account, are those of copper.

In these portions of the veins, the metal referred to, *occurs very frequently* in the form of native copper, with which are associated the red oxid, azure carbonate, green carbonate, and more rarely what may be denominated copper black, and still more rarely, pyritous copper. *None* of these have been noticed in a crystaline form.

It must not be imagined that these several minerals make up the whole or even any very considerable portion of the entire length and breadth of the veins, in which they occur, for they are distributed in bunches, strings, and comparatively narrow sub-veins, in a manner precisely analogous to that in which these ores are usually distributed, in similar rocks, in other portions of the globe. The quartz veinstone, before described, has always so much of the green tinge communicated by the carbonate of copper, that it cannot fail to be detected; but the presence of disseminated native copper, in this veinstone, would, at first, hardly be suspected, and it is not until a fresh fracture has been made, and the mineral closely examined, that the numerous dark points and minute threads are discovered to be copper in a native state. Large portions of this quartz veinstone, (when the included metal can scarcely be detected by the naked eye,) when examined with a glass, are found to contain very delicate threads of native copper, that traverse the quartz in every possible direction, and so completely is this latter mineral bound together, that it is fractured with difficulty, and its toughness is very greatly increased.

The specific gravity of this veinstone is very considerably above that of ordinary quartz, and usually, the difference is so considerable, even in those masses where the copper can scarcely be detected by the naked eye, as to be apparent to even the most careless observer. But in addition to this finely disseminated condition of the native copper in the veinstone, it is also disseminated in a similar manner through the rocky matter embraced by the veinstone and in the amygdaloid and conglomerate portions of the rocks, it sometimes extends, for a distance of from two to three feet into the rocky matter on either side of the veins, sometimes completely, or in part, filling the cells of the amygdaloid rock.

The conditions above described refer to the main portions of the veins only, while there are other portions in which the copper appears to be concentrated in larger masses, constituting bunches and strings, and in which places the sides or walls of the veins are sometimes wholly made up of thin plates of native copper. In these portions of the metalliferous veins where the metal appears, as it were, to be concentrated, it also occurs, much in the form before described, except that the masses of metal vary from the merest speck to that of several pounds weight. In opening one of these veins, at a concentrated point, the observer, unless he had previously examined other portions of the vein, would be led to erroneous conclusions as to its richness, a source of error which cannot be too strongly guarded against; for while the vein, for a short distance, may be found to be exceedingly rich in mineral, the mineral in another portion of the vein may either wholly or in part disappear, a condition which is similar to that observed in those veins of copper that have been extensively worked and found to be most productive, on the continent of Europe and the island of Great Britain.

The excess of native copper, (compared with the other ores,) which occurs, *in these portions* of the veins, is a peculiar feature, for it may be said, in truth, that other ores are of rare occurrence. In those portions of the veins *traversing the trap*, and where other ores do occur, it is usually under such circumstances as to favor the presumption that their origin is chiefly from that which was previously in a native form; for the carbonates and oxids, almost invariably appear either investing the native copper, or intimately associated with it, though they sometimes appear in distinct sub-veins. Pyritous copper is so rare, in connection with the trappean portions of the veins, as scarcely to deserve notice.

I have already stated that native silver, occasionally, though very rarely, occurs in the trappean portions of these veins, intimately associated with the copper, but it is in so minute quantities as to render it probable that it will not prove of any practical importance. Other mixed compounds of this metal occur so rarely as scarcely to deserve notice.

Leaving the trap rock, the character of these veins, as they traverse the conglomerate, undergoes important changes; for not only does the veinstone become gradually changed, from quartz to calcareous spar, but the amount of native copper diminishes, and its place is either supplied wholly or in part by ores of zinc and calcareous spar, or wholly by this latter mineral. There are, however, occasional exceptions to this *general* rule, for occasionally the place of the native copper in the veins. in their passage through the conglomerate, is supplied by a variety of complex compounds of the same metal, which compounds are of exceeding interest; but this change would appear always to be intimately connected with, or to bear some relation to, the dykes of trap which traverse the conglomerate rock. Several instances of this kind were noticed upon the northerly side of Keewenaw Point, either directly upon or near to the coast, as also at several other places in the interior, westerly from Keewenaw Point. A vein, which may without doubt be referred to as one of this character, (though in consequence of intervening bays and lakes between it and the ranges to the south, its connection with the main range has not been seen,) will serve to illustrate the character referred to.

This vein, which reaches the immediate coast of the lake, upon the easterly cape of the bay known to the voyagers as the Grande Marrais of Keewenaw Point,* terminates, so far as examinations can be made, in the coarse conglomerate rock. The coast of the lake, for many miles on either side, is made up of abrupt cliffs of a similar rock, as usual, being made up of coarse rolled pebbles of trap, chiefly cemented with calcareous matter, which is usually associated, more or less, with the red oxyd of iron. Immediately south of the coast, a heavy dyke of trap traverses the conglomerate, which dyke corresponds in position with the line of bearing and dip of the conglomerate rock.

The vein, which, at its termination upon the immediate coast of the lake, has an extreme width of about 10 feet, may be traced, in the bed of the lake, in a direction north 5° east, for a distance of several rods, after which, in consequence of the depth of water, it is completely lost. This vein, at the point where it appears upon the coast, may be said to be in a concentrated state, or in a condition analogous to that before described, where the native copper occurs in the condition of bunches and strings, though the condition in which the metallic minerals occur is essentially different from that in the trap; for, instead of native copper, we have several mixed forms of the green and blue carbonates of copper and copper black, more or less inti-

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**Copper* Harbor.

mately associated with calcareous spar, and in the adjoining rock, and in small ramifying veins, occasional small specks and masses of native copper, weighing from 1 to 3 ounces, occur, but these are by no means abundant. No quartz occurs as a veinstone, and none of the ores have been noticed in a crystaline form.

It has already been stated, that these true veins, in traversing the conglomerate, frequently almost lose their character, and it becomes difficult to define their absolute width, or in other words, it would appear as if, at the time of the formation of the veins, the conglomerate had not been perfectly cemented, the result of which would be, that the mineral matter, which, under other circumstances, would constitute a perfect vein, would frequently appear in only an imperfect one, or the mineral which would under other circumstances, make up the vein itself, may have been injected laterally through the interstices of the rolled masses constituting the conglomerate, in which case the mineral would, in fact, take the place of the ordinary cement, thus simply investing the pebbles of the conglomerate. Now, although at the point under consideration, a wide and remarkable distinct vein is developed, the rock, for many feet on either side, has the interstices between the pebbles filled wholly, or in part, with various mixed and irregular forms of the ores, accompanied by calcareous matter, as before stated, and with occasional specks and small masses of native copper.

Those veins traversing the conglomerate take on a similar character, to a greater or less extent, rather frequently, but the place of the copper is more usually supplied by the siliceous oxyd, and more rarely by the carbonate of zinc, which compounds, sometimes may be seen forming a perfect or partial cement to the rock, for considerable distances on either side of the main vein. These ores of zinc, like those of copper, are uniformly amorphous, and almost invariably more or less associated with some form of carbonate of lime, with which they may, under some circumstances, unless closely examined, be confounded.

Although these copper and zinc ores occasionally appear in considerable quantities, in those portions of the veins traversing the conglomerate, they usually embrace or simply incrust portions of the rocky matter; or rather the rocky matter and those ores appear to be coarsely and mechanically mixed. These veins furnish beautiful cabinet specimens of the blue and green carbonates of copper, and more rarely of pyritous copper, together with the other varieties mentioned.

Having already devoted a larger space to the consideration of these veins than had been intended, I will simply add, that in pursuing their course northerly, across the mixed rock and the red sandrock, their mineral character is nearly or quite lost, the veins as before stated, being made up either entirely of calcareous spar, or of that material containing very meagre ores or zinc.

The district of country to which these veins have been referred, thus far, only comprises the ranges of hills south of Lake Superior, but veins of a very similar character, and of similar mineral contents, also occur upon Isle Royale. The order and changes in the character of the veins upon Isle Royale is necessarily reversed, or in other words, the southerly point of the vein corresponds to that of the north point in the district south of Lake Superior. The mineral veins of Isle Royale have not been examined with sufficient care to enable me to determine with much certainty, their average width or value. Those examined *were mostly* narrow, the widest not exceeding eighteen inches; but in these the mineral contents are essentially the same as in those upon the south side of the lake.

Native copper, in very thin plates, was occasionally noticed, occupying irregularly the joints of the compact greenstone of Isle Royale, but invariably in comparatively small quantities. It should, however, be noticed of Isle Royale, that the veins, so far as examined, are less perfectly developed in their passage across the conglomerate, and that they very rarely contain any traces of zinc.

Upon the north shore of the Lake, no attention was given to the subject of mineral veins, but, from the character of the geology of that district, it may be inferred that they will also be found in portions of it, and that, where they do occur, they will be uniformly either directly upon or not far from the coast of the Lake.

In addition to the *regular* veins already described, irregular veins frequently occur, traversing the whole, or portions of the outliers of trap, or those knobs which appear to have been elevated singly; and, although these veins may, without doubt, be referred to the same epoch as the regular veins before described, they nevertheless frequently differ considerably in mineral contents.

The limits of the present report will not permit a separate description of these several distinct trap knobs. I will, therefore, confine my remarks to that already referred to, as occurring upon the south coast of Lake Superior, immediately northwest from Riviere Du Mort, and which forms the promontory known as Presque Isle.

In nearly all those portions of this knob, where the trap, conglomerate and sandstone, are exposed in such a manner as to permit examination, each of the rocks are seen to be traversed by innumerable irregular ramifying veins, which in the sandstones are made up of quartzose and calcareous matter; but many of which, near the junction of the igneous and sedimentary rocks, are metalliferous, and this metalliferous character is more fully developed as the veins are extended into the trap rocks.

The metalliferous portion of these veins, rarely exceed three to four inches in width, and they ramify in such a manner that the mineral uniformly occupies situations similar to bunches or strings, at the junction of the ramifications. The minerals contained in the metalliferous portions of the veins, are sulphuret and carbonate of lead, earthy green carbonate of copper, pyritous iron, and more rarely, pyritous copper. Occasionally there is a quartzose, or mixed quartzose and calcareous veinstone; but more usually the several metallic minerals are blended in a base of rocky matter. The sulphuret of lead is distributed in the form of small cubic crystals, while the other metallic minerals are usually distributed either in irregular masses, or investing portions of the rocky matter. These associations are referred to, as showing the character which these irregular veins assume, rather than from any supposed value which they may possess for practical purposes.

In addition to the minerals referred to, the trap of Presque Isle occasionally contains asbestus, common serpentine and imperfect agates; the two former minerals usually occupying the narrow joints of the rock.

Before referring to the economical considerations connected with the veins which have been described, I will briefly refer to another situation in which the ores of copper have been observed in intimate connection with the trap range of rocks.

The southerly side, or greenstone portion of the trap range, appears to have been elevated in such a manner as to have caused but little disturbance to the sandrock lying between that and the range of simply altered rocks lying still farther to the south; but near to the junction of the sandrock and greenstone, there is usually a red slate resting against the trap, and which may be said to fill up, in a measure, the irregularities in the ranges of hills. This slate, which is sometimes seen of 100 to 200 feet in thickness, though usually it appears as a mere band, is traversed by irregular and imperfect veins, of what may be denominated a ferruginous steatite, containing placentiform masses of greasy and milkish quartz, that sometimes contain more or less of the ores of copper. The earthy carbonates of copper are also sometimes so intimately connected with these veins of steatitic matter, as at first to be scarcely recognized. More rarely, distinct, very thin veins of green carbonate of copper occur, well characterized, in this red slate, though these veins are never of any great length. The red shale extends, more or less perfectly, along the whole length of the trap range, skirting that range of hills upon the south, but I have not yet been enabled to devote sufficient time to its examination to enable me to determine whether any portions of these veins can be regarded as of practical importance. The examinations which have been made, would lead me to look unfavorably upon these veins, and I regard them as having an origin completely distinct from that of the veins which traverse the northerly escarpment of the trap rock.

Having thus considered all the general circumstances under which the several ores of copper, zinc, lead, iron, manganese and silver have been noticed, in connection with the trap rock and the sedimentary rocks, immediately resting upon it, it becomes important to consider how far inferences may be drawn from these examinations, as to their occurrence in such quantities as to be of practical importance. I have already stated that so far as regards the ores of lead, iron, manganese and silver, I am lead to conclude that at none of the points examined do they occur in veins, or otherwise, sufficiently developed to warrant favorable conclusions as to their existence in sufficient quantities to be made available, and from all that is now known of the country, I am led to infer that neither of these, unless it be iron, will be so found.*

The examinations which have thus far been made of those portions of the veins containing ores of zinc, have not been extended sufficiently to enable me to determine with much satisfaction, their extent as a whole. At several points in the veins these ores are sufficiently abundant to admit of being profitably worked, but I would be unwilling, from an examination of a few points, to attempt to determine the character of the whole.

In considering the practical value of the copper ores of the upper peninsula of Michigan, where we are as yet compelled to judge from our examination, of what may be said to be the simply superficial portions of the veins, we can arrive at no safe conclusions, except by comparison of the district with those districts similarly situated, which have been extensively worked in other portions of the globe. Comparisons of this character, to be really useful, must necessarily be sufficiently minute to enable us to understand the relations which the ores in the districts compared, bear to each other, in all respects, which circumstances render it necessary that a degree of minute information should be at hand, that is not at all times to

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*These remarks are intended to apply directly to the trap region. Beds *of bog iron ore* occur, east from Chocolate river, which probably may at *some future day* be profitably worked.

be obtained. As the information on hand, with respect to the copper and tin veins of Cornwall, England, is more minute than that of any mineral district known, I propose, in order to avoid confusion, to confine my comparison to this district, simply, premising that however closely the two districts may resemble each other in character, it does not follow, as an axiom, that because the district with which we compare our own has been largely and profitably productive, that of Michigan must necessarily be so too; for it will be seen, as the subject is pursued, that there are not only several points in which it is impossible with our present knowledge of that of Michigan, to institute comparisons, but there are also some points on which there is a considerable degree of discrepancy.

The comparison instituted, in the main, is intended to refer rather to the character and contents of the mineral veins of the two districts than to the geology, although some general reference becomes necessary to the geology of the districts, to render the comparison perfect. The topography of the Cornish district bears a close resemblance to that of Michigan, both districts being marked by their irregular and broken outline, and by the occurrence of more or less frequent, nearly insulated knobs, rising to a considerable height above the elevation of the general ranges.

Although the older rock of Cornwall, or that from which the metalliferous veins of the district may be said to have their origin, is more distinctly granitic than that of the metalliferous region upon Lake Superior, the elements of which the rocks are composed, may be regarded as essentially bearing a very close resemblance; a resemblance which, it is conceived, would have been still more perfect *had the* granitic rocks of Cornwall been subj action of secondary causes similar to those of the region under consideration. The rocks resting upon or against the granitic rocks of Cornwall, consist of clay slates, hornblende rocks, &c., which bear little real analogy to the rocks resting directly upon the trap of Lake Superior, but it is conceived that the composition of these upper rocks has little bearing upon the origin of the metalliferous veins, and may be regarded as in a measure unimportant; and however much these rocks may differ, they are traversed alike by the metalliferous veins of the lower rocks in such a manner, that the close resemblance cannot be mistaken.

It is a matter of history that the ores of tin have been, more or less, extensively raised in the mineral district of Cornwall, from the earliest settlement of the island of Great Britain, but the working of the veins of copper at an early day, does not appear to have been carried on to any very considerable extent. The great importance to which the produce of copper from the Cornish veins, (in a district which, compared with the mineral district of our own state, is of very small dimensions,) has arisen, will be shown from the accompanying table, which I have reduced from the official returns, included in the several years, and which table, it will be seen, shows for a series of years, the average annual amount of copper produced from the ore, the average amount of which it sold, together with the amount per cent of copper contained in the ore, and the average value of the copper, per pound, at the smelting house. This table, which has been drawn with great care, from data that can scarcely lead to incorrect results, will not only serve to show the large aggregate amount of the metal produced, but it also shows, from the low average per cent of metal contained in the ores, (if we had no further knowledge upon the subject,) that much capital must be required for, and a large amount of labor applied to the raising and smelting of these ores; a circumstance which should be carefully borne in mind, in all that relates to the mineral district of Michigan.

Table showing the average annual produce of the Copper mines of the County of Cornwall, England, from 1771, *to* 1822.

YEARS.	Average No. of tons of ore per year.	Av. No. of tons copper produced per year.	Av. amount per year for which sold.	Av. per ct. of copper produced from the ore.	Av. value of the copper per lb.	
					c.	*m.*
1771 to 1775—5 years	28,749	3,449	$846,283	12	10	9
1776 to 1780 5 "	27,580	3,309	826,609	12	11	1
1781 to 1786 6 "	34,354	4,122	962,380	12	10	4
1796 to 1802 7 "	51,483	5,195	2,125,046	10	18	2
1803 to 1307 5 "	70,923	6,160	3,174,725	8	23	
1808 to 1812 5 "	70,434	6,498	2,886,835	9	12	9
1813 to 1817 5 "	82,610	7,272	2,878,723	8 8	17	6
1818 to 1822 5 "	94,391	7,757	3,111,311	8 2	17	9

The general resemblance in the mineral contents of the copper veins of Cornwall and those of Michigan, is for the most part very great, though in some respects there is a considerable discrepancy. It should, however, be remarked, that some difficulty exists in comparing the mineral veins of Cornwall, where several of them have been worked to depths varying from 1,000 to 1,500 feet, with those of Michigan, where the examinations are nearly superficial.

In making these deep excavations, not only in the county of Cornwall, but also in the copper districts of Bohemia, Hungary, Silesia, Transylvania, Saxony, &c. (some of the *veins in the* latter districts having been explored to a depth very considerably greater than those of Cornwall,) an immense mass of facts has been accumulated, with respect to the general formation and mineral character of veins, or lodes of copper, which facts have led to an understanding of many of the contingencies connected with its associations, so universal, that, when applied to this mineral, they may be regarded as general laws, that may fairly be inferred to govern, with more or less certainty, all those lodes or veins which have similar geological relations. Though a general consideration of those relations of the veins of other countries, may, perhaps, be regarded as somewhat foreign to the present report, I deem it more advisable to refer to these general laws in such a manner as to leave the reader to judge, by comparison, the condition in which the ores of Michigan may be fairly inferred to occur, rather than to draw conclusions directly; and, in so doing, it will also become necessary to refer to some of the characters of mineral veins, or lodes, in general.

Veins are usually divided into two general orders, viz: "*cotemporaneous veins*, or those which were formed at the same time as the containing rock, and *true veins*, whose formation is supposed to be subsequent to that of the rocks which are contiguous to them." A *true* vein may be defined to be "the mineral contents of a vertical or inclined fissure, nearly straight, and of indefinite length and depth."* The contents of a true vein, as a general rule, differ widely from the character of the rocks which it intersects, though this does not invariably hold good, and the vein also, as a general rule, has well defined walls.

The contents of cotemporaneous veins, bear a much closer resemblance to the rocks which embrace them, and as a general rule, they are shorter, more crooked, and less perfectly defined than true veins.

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* *Carne, on the mineral* veins of Cornwall.

The metalliferous veins being contained under the head of true veins, it is to these that the whole of my remarks will be directed.

Metallic veins are the repositories of most of the metals excepting iron, manganese and chrome, which occur more frequently and abundantly in beds than in veins. The thickness of metallic veins varies from a few inches to many feet, and the same vein also varies in thickness in different parts of its course, sometimes contracting to a narrow string of ore, and then expanding again to a width of many feet. The deposites of metal in the veins are as irregular as the widths of them, and so much so as to render the profits of mining proverbially uncertain. Ore is generally found to occupy certain portions of the veins only, differing constantly in extent, whether the length or depth on the course of the vein be considered, or the portion of its width which is filled up by it. No veins occur which are regularly impregnated with metal to any great extent, and when ore is found, it is in what the miners aptly term bunches or shoots, or in interspersed grains and strings, which are more or less connected with, or embraced in, veinstone, that, according to the rock which the veins intersect, will be fluor spar, calcareous spar, quartz, &c. The unproductive parts of veins, even in the most profitable mines, generally far exceed in extent the productive parts, but that mine is considered to be rich which has either frequent or extensive shoots of ore, and the great art of the miner consists in tracing and working the valuable accumulations of the metals, with as little waste of labor and expense on the poorer portions of the veins as possible. "In the mines of Cornwall, the ores of copper and tin commonly occur in detached masses, which are called bunches of ore; and the other parts of the vein, being unproductive, are called *deads*."

The depth to which metallic veins descend is unknown, for we believe no instance has occurred of a *considerable vein being worked out in depth*, though it may sink too deep to render the operation of the miner profitable, or it may branch off in a number of strings which are too much intermixed with the rock to be worked to advantage.* Some veins appear to grow wider, while others contract as they descend.

The superficial part of a vein generally contains the ore in a decomposing state, and it frequently happens that the ores in the upper and lower parts of a vein are different; thus, "in Cornwall, blende or sulphuret of zinc often occupies the *uppermost* part of the vein, to which succeeds tinstone, and at a greater depth, copper pyrites." When a metallic vein, in its descent, passes through different kinds of rock, it is frequently observed that the products of the vein vary in each bed, and when it passes through regularly stratified beds of the same rock, there are particular strata in which the vein is always found most productive. This change in the productiveness of mineral veins is more particularly noticed at or near to the transition from unstratified to stratified rocks; thus, granite, syenite and those rocks which have a graniti-form structure, are frequently noticed to contain metals at or near their junction with stratified formations. On the other hand, the veins which traverse stratified rocks are, as a general law, more metalliferous near such junctions, than in other portions.†

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* *Koenig.*

† Lyell. Necker.

Where a rock is crossed and penetrated by a great number of small veins in every direction, the whole mass is sometimes worked as an ore, and is called by the Germans a "stockworke." Where the ore is disseminated in particles through the rock, such rocks are also worked for the ore, when its exists in sufficient quantity.

As a general rule, those metals which are oxidable at ordinary temperatures, or which readily combine with sulphur, *rarely occur in a metallic state*, but are usually found in combination either with sulphur, oxygen or acids. The chief ore of copper raised from the mines of Cornwall, is the yellow sulphuret, though the blue and green carbonates and arseniate are more or less distributed; native copper and the oxids are also, though more rarely, found.

By a comparison of what has been said upon the character and mineral contents of metallic veins in general, I trust a just view of the real condition in which the ores of copper are invariably found, will have been conveyed, and that, by the aid of this, we will be enabled to examine, without undue expectations, those mineral veins which occur within the limits of our own state. In the main the resemblance between the character and contents of the copper veins of Cornwall and Michigan, so far as can be determined, is close; the veinstones, (with the exception of fluor, which I have never observed in the latter,) are essentially the same; but in instituting this comparison, it should be borne in mind that the metallic veins of Cornwall have been in progress of exploration for centuries, and that shafts and galleries have been carried to great depths, while of those of Michigan, simply superficial examinations have as yet been made, and these in a wilderness country, under circumstances of the utmost embarrassment, and attended with the utmost excessive labor, privation and suffering.

In respect to the character of the ores which occur in the two districts, there are important differences, for while pyritous copper is the most important workable ore, not only in the Cornish mines, but also in those of other portions of our globe, it is comparatively of rare occurrence in the mineral district of Upper Michigan; for, as I have already mentioned, the mineral of the trappean portions of the veins in the latter district, is essentially made up of strings, specks and bunches of native copper, with which more or less of the oxids and carbonates are associated; while those portions of the veins traversing the conglomerate are characterized by the occurrence of the oxids and carbonates, with occasional metallic and pyritous copper, or the places of all these are supplied by ores of zinc, associated with more or less calcareous matter. In the thin mineral veins of Presque Isle, pyritous copper is more abundant, where it is associated with sulphuret of lead, as before mentioned.

The occurrence of this native copper in the veins, and the manner in which it is associated with the veinstones, in all respects corresponds with the ordinary association of the other forms of ores, in those veins that have been extensively worked in other portions of the globe; but I confess that the preponderance of native to the other forms of copper, was regarded as an unfavorable indication, at least until this had been found to be more or less universal with respect to all the veins. It should, however, be remarked, that in those portions of the veins where the quartz of the vein and the accompanying rock are very compact, the native form is much more common than in those portions where the veinstone and accompanying rock are more or less cellular and soft.

The worked copper veins of Cornwall, are stated by a Mr. Carne, to average from three to four feet in width, and to have a length as yet undetermined. But few have been traced for a greater distance than from one to one and a half miles, and but one has been traced for a distance of three miles.

The veins which I have examined in the mineral district of Michigan, exceed the average of those last mentioned, but the imperfect examinations which have been made, render it difficult to determine this with certainty. I have traced no one vein for a further distance than one mile, and usually for distances considerably less. It was not, however, supposed that these veins terminated at the points where they were left, but the further examinations were abandoned at these points, in consequence of physical difficulties connected with the present condition of the country.

The native copper is frequently free from all foreign matter, and is as completely malleable as the most perfect refined copper, but it more usually contains disseminated particles of earthy minerals, chiefly quartz. I have not been able to detect the alloy of any other metal, in a single instance.

The fatigues and exposures of the past season, have so far impaired my health, that, as yet, I have been unable to analyze as carefully, as could have been wished, the several ores furnished by the mineral veins of the upper peninsula, but sufficient has been done to show satisfactorily that the copper ores are not only of superior quality, but also that their associations are such as to render them easily reduced. Of those which have been examined, embracing nearly the whole, (and not including the native copper,) the per cent of pure metal, ranges from 9.5 to 51.72, and the average may be stated at 21.10. Associated with some of these ores, I have detected a metal, the character of which remains, as yet, undetermined.

Were the analysis of the several ores of copper sufficiently perfected, I should deem it unnecessary to lay them before you at this time, for with what is now known of the district, it is conceived, the result would lead to erroneous rather than correct conclusions. The analysis of separate masses of ore, no matter how much care may be taken to select the poor as well as the richer ores, for the examinations, will be usually far from giving the average per cent of what would be the product when reduced to practice. I have, in order to arrive at safe conclusions, not only analyzed, but also assayed many of them, but when we come to consider what constitutes the true value of a vein of copper ore, we will perceive why it is unsafe to judge of the whole by the analysis of small portions.

By reference to the previous statistical table of the product of the copper mines of Cornwall, it will be seen, that the average produce of the ores since 1771, has never exceeded 12 per cent of the metal, and that, from 1818 to 1822, it was only 8.2. This shows the aggregate, and it was well known that while many of the productive veins are considerably below this, the largest average per cent of any single vein, in that district, it is believed, has never been over 20 per cent, and it should be borne in mind that this average is taken after the ores have been carefully freed from all the rocky and other impurities, which can be separated by breaking and picking.

The value of a vein may be said to depend upon the *abundance of the* ore, and the ease with which it can be raised and smelted, rather than upon its purity or richness. Upon this point, with respect to our own mineral region, public opinion would perhaps be more in error than upon any other, and most certainly we could hardly look for a mineral district where the character of the ores were more liable to disseminate and keep alive such errors. The occurrence of masses of native metal, either transported or in place, are liable to excite, with those who have not reflected upon the subject, expectations which can never be realized, for while, in truth, the former show nothing but their own bare existence, the latter may be, as is frequently the case, simply imbedded masses, perfectly separated from all other minerals, or they may be associated in a vein where every comparison would lead to unfavorable conclusions, as to the existence of copper, in any considerable quantities. I have frequently noticed very considerable masses of native copper, occupying the joints of compact greenstone, under such circumstances as I conceive, might readily excite in many minds, high expectations, but a little reflection would satisfy the most careless observer of the uselessness of exploring these joints, under the expectation or hope of finding them a valuable repository of the metal. Again, not only native, but also the other ores of copper occur in veins, either so narrow as to render it useless to pursue them, or so associated as to render it probable that exploration would not be attended with success.

While I am fully satisfied that the mineral district of our state will prove a source of eventual and steadily increasing wealth to our people, I cannot fail to have before me the fear that it may prove the ruin of hundreds of adventurers, who will visit it with expectations never to be realized. The true resources have as yet been but little examined or developed, and even under the most favorable circumstances, we cannot expect to see this done but by the most judicious and economical expenditure of capital, at those points where the prospects of success are most favorable. It has been said of the Cornish district, in respect to the supposed large aggregate profits, that "a fair estimate of the expenditure and the return from all the mines that have been working for the last twenty or thirty years, if the necessary documents could be obtained from those who are interested in withholding them, would dispel the delusion which prevails on this subject, as well as check that ruinous spirit of gambling adventure which has been productive of so much misery."* And if these remarks will apply to a comparatively small district, which has been explored and extensively worked for centuries, with how much more force must they apply to the mineral district of our own state. I would by no means desire to throw obstacles in the way of those who might wish to engage in the business of mining this ore, at such time as our government may see fit to permit it, but I would simply caution those persons who would engage in this business in the hope of accumulating wealth suddenly and without patient industry and capital, to look closely before the step is taken, which will most certainly end in disappointment and ruin.

The extreme length of what I have denominated the mineral district, (within the limits of Michigan,) may be estimated at a fraction over 135 miles, and it has a width varying from one to six miles; but it must not be imagined that mineral veins occur equally through all portions of it, for sometimes, for many miles together, none have been noticed, and the situation of the country is such as to render it probable they never will be. The range and course of the mineral district has been so far defined as to render it unnecessary to say more upon this subject to enable such persons as may wish to examine, to pass directly along its complete length.

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* Hawkins on the tin of Cornwall.

I have thus far omitted to allude particularly to the large mass of native copper, which has been so long known to exist in the bed of Ontonagon river, lest, perhaps, this isolated mass might be confounded with the products of the veins of the mineral district. That this mass has once occupied a place in some of these veins is quite certain, but it is now perfectly separated from its original connection, and appears simply as a loose transported bowlder.

The attention of the earliest travellers was called to this mass of metallic copper by the natives of the country, and it has been repeatedly described by those who have visited it. The mass now lies in the bed of the westerly fork of the Ontonagon river, at a distance which may be estimated at twenty-six miles, by the stream, from its mouth. The rugged character of the country is such, that it is but rarely visited; in proof of which I may state, that upon my visit to it, during the last year, I found broken chissels, where I had left them on a previous visit, nine years before, and even a mass of the copper, which at that time had been partially detached, but which, for the want of sufficient implements, I was compelled to abandon, was found, after that interval, in precisely the same situation in which it had been left.

The copper in this bowlder, is associated with rocky matter, which, in all respects, resembles that associated with that metal in some portions of the veins before described, the rocky matter being bound together by innumerable strings of metal; but a very considerable portion of the whole is copper, in a state of purity. The weight of copper is estimated at from three to four tons.*

While the mass of native copper upon Ontonagon river cannot fail to excite much interest, from its great size and purity, it must be borne in mind, that it is a perfectly isolated mass, having no connection whatever with any other, nor does the character of the country lead to the inference that veins of the metal occur in the immediate vicinity, though, as before stated, the mineral district crosses the country at a distance of but a few miles.

The occurrence of cornelian, chalcedony, agate and amethystine quartz, in the amygdaloidal portion of the trap, has already been noticed, and these minerals are considerably abundant. They frequently possess very great beauty and perfection, and when ground and polished, they may be used for all the purposes to which those minerals are usually applied.

By the act admitting Michigan as a state into the confederacy, and in which her boundaries are defined, it does not appear to have been the intention to include within her limits any portion of territory lying upon the north shore of Lake Superior, but in consequence of the peculiar shape of the coast at that point where the *national* boundary line "last touches Lake Superior," at the mouth of Pigeon river, a direct line to the mouth of Montreal river, if followed literally, would throw within the state of Michigan, several small rocky islands, together with a few miles of the south cape of Pigeon bay, situate upon the north coast. This boundary leaves in Wisconsin the whole of the Apostles' group of islands, near to the south coast, while it includes within Michigan, Isle Royale, situate near to the north coast of the Lake.

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* This mass of copper was removed by Julius Eldred, and after considerable masses had been cut from it, was weighed in New York, November, *1843, and found to weigh* 3708 pounds, net avoirdupois.

Isle Royale is a little less than an Island of rock, rising abruptly from the lowest depth of the Lake, in irregular hills, to a height varying from 100 to 450 feet above the level of the Lake. The island has a length of a fraction over 45 miles from northeast to southwest, and a breadth varying from 3 1-2 to 8 miles. The most northerly point of the island is very nearly in latitude 48° 12′ 30″ north, and the parallel of longitude 89° west from Greenwich, crosses the island a little east from its centre. Its nearest approach to the main land is near its northwesterly end, where it is separated from a point of the north coast, a few miles east from Pigeon river, by a distance of a fraction less than thirteen miles. Isle Royale is separated from Keewenaw point, of the south coast, by a distance of forty-four miles, and the elevated hills of this point may be distinctly seen from Isle Royale, when the atmosphere is clear.

Nearly the whole of the northwesterly side of Isle Royale is a continuous, elevated, rocky cliff, which will scarcely admit of a landing; but the southeasterly side, together with the easterly and westerly ends, are deeply indented with bays, which form secure harbors. The northeasterly end is made up of a series of elevated, rocky spits, with intervening bays. These spits of rock continue for a length varying from ten to twelve miles, with a width scarcely exceeding half a mile, and altogether, they may not inaptly be compared to the hand with the fingers half spread. The bays have a sufficient depth of water to admit vessels of the largest class to enter nearly one-third the whole length of the island.

Much of Isle Royale is absolutely destitute of soil, and the island has a most desolate appearance ; but notwithstanding this, it is of immense value for its fisheries, which are yet scarcely appreciated.

Though not within the limits of our state, I will briefly refer to the general character of a portion of the country west from Pigeon river, on the north coast. That district of country upon the immediate coast, extending from our national boundary, at Pigeon river, to Fond du Lac, is more decidedly and abruptly mountainous than any portion of the south coast of the lake. The hills rise in broad and somewhat knobby steppes or plateaus, to heights varying from 400 to 1,200 feet above the lake, and the summits of these hills are usually not farther inland than from ten to twenty miles. The rocks of the hills are very frequently bare over considerable areas, and the valleys containing arable soil, are few and very narrow.

The route of the fur trade to the northwest, *via* Rainy Lakes, Lake of the Woods, and Lake Winnipec, was formerly wholly carried on by passing over these hills, from a point a few miles west from the mouth of Pigeon river. The trail or portage path passes over a low portion of the range, and finally falls upon Pigeon river, which is ascended to its source, from which, by a series of portages, the sources of the streams flowing northwesterly are reached. The hilly portion of the country, though of exceeding interest in a geological point of view, is the most desolate that could be conceived.

STANARD'S ROCK,

Was discovered by Capt. Charles C. Stanard, at four o'clock, P. M. August 26, 1835.

"The course to this rock from the east end or point of Manitou Island, is twenty-seven miles S. E. half E., and from Point Abbaye, forty-five miles E. by N. 3-4 N., lat. 47° 8′ north, long. 87° 24′ west from Greenwich.

"On both of my visits to the rock, the sea was too rough to allow me to land on it, but from the mast head of the vessel, it appeared to be about twelve or thirteen feet long, by five or six feet broad, and rising above the surface about three feet. On the south, southeast, east and northeast sides, the water is deep. On the west, southwest, and northwest sides, the water is quite shoal for some distance out; and from the rock about N. N. W. runs a reef to the distance of about eighty or ninety rods.

"The composition of the rock is the same as the trap of Point Keewenaw. This I learn from Mr. Mendenhall. I also saw a piece of the rock brought away by one of the sailors of the Algonquin."—*Capt. B. A. Stanard.*

GLOSSARY.

INCLUDING THE TECHNICAL TERMS USED IN THIS WORK.

Alluvion or Alluvium. Recent deposites of earth, sand, gravel, mud, stones, peat, shell banks, shell marl, drift sand, &c., resulting from causes now in action. This term is generally applied to those deposites in which water is the principal agent.

Amorphous. Bodies devoid of regular form.

Amygdaloid. A trap rock which is porous and spongy, with rounded cavities scattered throughout its mass. Agates and simple minerals are often contained in these cavities.

Anticlinal. An anticlinal ridge, or axis is where the strata along a line dip contrariwise, like the sides of the roof of a house.

Arenaceous. Sandy.

Argillaceous. Clayey.

Augite. A simple mineral of variable color, from black through green and gray to white. It is a constituent of many volcanic and trappean rocks, and is also found in some of the granitic rocks.

Basalt. One of the common trap rocks. It is composed of augite and feldspar, is hard, compact, and dark green or black, and has often a regular columnar form. The Palisades of the Hudson show the columnar aspect of trap rocks. The giant's causeway is cited as an example of basaltic rocks, and the columnar structure is there very strikingly displayed.

Blende. Sulphate of zinc. A common shining zinc ore.

Bluffs. High banks of earth or rock with a steep front.

The term is generally applied to high banks forming the boundaries of a river or river alluvions.

Bog Iron Ore, Ochre. A variety of ore of iron which has been deposited by water. Chiefly in low, wet ground.

Botryoidal. Resembling a bunch of grapes in form.

Bowlders. Erractic group. Lost rocks. Rocks which have been transported from a distance, and more or less rounded by attrition or the action of the weather. They lie upon the surface or loose in the soil, generally differ from the underlying rock in the neighborhood.

Breccia. A rock composed of angular fragments cemented together by lime and other substances.

Calcareous rocks. A term synonymous with limestone.

Calcareous spar. Crystalized carbonate of lime.

Carbonates. Chemical compounds containing carbonic acid, which is composed of oxygen and carbon.

Chalybeate. Impregnated with iron.

Chert. A siliceous mineral, approaching to chalcedony, flint and hornstone. It is usually found in limestone.

Chlorite. A soft green scaly mineral, slightly unctious.

Chlorite slate. Slate containing chlorite.

Clinkstone. A slaty feldspathic or basaltic rock, which is sonorous when struck.

Cleavage. The separation of the laminae of rocks and minerals in certain constant directions. They are not always parallel to the planes of stratification, but are often mistaken for them.

Conformable. When strata are arranged parallel with each other, like the leaves of a book, they are said to be conformable. Other strata lying across the edges of these may be conformable among themselves, but *unconformable* to the first set of strata.

Conglomerate, Crag or Puddingstone. Rocks composed of rounded masses, pebbles and gravel cemented together by a siliceous, calcareous, or argillaceous cement.

Cretaceous. Belonging to the chalk formation.

Crop out and out crop. Terms employed by geologists and mining engineers, to express the emergence of rock, in place, on the surface of the earth at the locality where it is said to crop out.

Crystaline. An assemblage of imperfectly defined crystals, like loaf sugar and common white marble.

Dykes. A kind of vein intersecting the strata, and usually filled with some unstratified igneous rock, such as granite, trap or lava. These materials are supposed to have been injected in a melted state into great rents or fissures in the rocks.

Diluvium or Diluvion. Deposites of bowlders, pebbles and gravel, which many geologists have supposed were produced by a diluvial wave or deluge sweeping over the surface of the earth.

Dip. Where strata are not horizontal, the direction in which their planes sink or plunge, is called the direction of the dip, and the angle of inclination, the angle of dip.

Dolomite. A magnesian limestone belonging to the primary class. It is usually granular in its structure, and of a friable texture.

Embouchure. From the French, signifying mouth or entrance, (of a river.)

Eocene. The strata deposited during the oldest of the tertiary epochs, as, for example, the Paris basin.

Estuaries. Inlets of sea into the land. The tides and fresh water streams mingle and flow into them. They include not only the portion of the sea adjacent to the mouths of rivers, but extend to the limit of tide water on these streams.

Fault. A dislocation of strata, at which the layers on one side of a dyke or fissure have slid past the corresponding ones on the other. These dislocations are often accompanied by a dyke. They vary from a few lines to several hundred feet.

Feldspar. One of the simple minerals, and next to quartz, one of the most abundant in nature.

Ferruginous. Containing iron.

Galena. An ore of lead composed of lead and sulphur.

Garnet. A simple mineral, which is usually red and crystalized. It is abundant in most primitive rocks.

Gneiss. A stratified primary rock, composed of the same materials as granite, but the mica is distributed in parallel layers, which will give it a striped aspect.

Geode. Geodiferous. Geodes are small cavities in rock generally lined with quartzose or calcareous crystals.

Economical Geology refers to the applications of Geological facts and observations to the useful purposes of civilized life.

Granite. An unstratified rock, composed generally of quartz, feldspar and mica, and it is usually associated with the oldest of the stratified rocks.

Graywacke, Grauwacke. A group of strata in the transition rocks; but the term has been so indefinitely applied, that other names will probably be substituted.

Greenstone. A trap rock composed of hornblende and feldspar.

Grit. A coarse-grained sandstone.

Hornblende. A mineral of a dark green or black color, and which is a constituent part of greenstone.

Hornstone. A siliceous mineral, approaching to flint in its character.

In situ, *In place*. In their original position where they were formed.

Laminae. The thin layers into which strata are divided, but to which they are not always parallel.

Line of bearing, is the direction of the intersection of the planes of the strata with the plane of the horizon.

Linear survey. A plan of surveying adopted by the United States government, by which the public lands are divided into rectangles, by straight lines.

Loam. A mixture of sand and clay.

Magnetic Meridian. A great circle passing through or by the magnetic poles of the earth; to which the *compass needle*, if not otherwise hindered, conforms itself. This "line of no variation," is not stationary, but shifts eastward or westward of the true meridian, during a term of years.

Mural Escarpment. A rocky cliff with a face nearly vertical like a wall.

Mammillary. A surface studded with smooth small segments of spheres like the swell of the breasts.

Matrix. The mineral mass in which a simple mineral is imbeded, is called its *matrix* or *gangue*.

Mechanical origin, Rocks of. Rocks composed of sand, pebbles or fragments, are so called, to distinguish them from those of a uniform crystaline texture, which are of chemical origin.

Metamorphic Rocks. Stratified division of primary rocks, such as gneiss, mica slate, hornblende slate, quartz rock, &c., and which may probably be regarded as altered sedimentary rocks.

Metalliferous. Containing metals or metallic ores.

Mica. A simple mineral, having a shining silvery surface, and capable of being split into very thin elastic leaves or scales. The brilliant scales in granite and gneiss are mica.

Micaceous. In part composed of scales of mica.

Mica Slate. One of the stratified rocks belonging to the primary class. It is generally fissile, and is characterized by being composed of mica and quartz, of which the former either predominates, or is deposited in layers, so that its flat surfaces give it the appearance of predominating.

Native Metals. Those portions of metals found in nature in a metallic, or uncombined state, are called native.

New Red Sandstone. "A series of sandy and argillaceous, and often calcareous strata, the prevailing color of which is brick-red, but containing portions which are greenish grey. These occur often in spots and stripes, so that the series has sometimes been called the variegated sandstone. The European, so called, lies in a geological position immediately above the coal measures."

Nodule. A rounded, irregular shaped lump or mass.

Ochre. See bog iron.

Old Red Sandstone. "A stratified rock, belonging to the carboniferous group of Europe."

Out-crop. See Crop out.

Oxid. A combination of oxygen with another body. The term is usually limited to such combinations as do not present active acid or alkaline properties.

Porphyry. A term applied to every species of unstratified rock, in which detached crystals of feldspar are diffused through a compact base of other mineral composition.

Primary rocks. Those rocks which lie below all the stratified rocks and exhibit no marks of sedimentary origin. They contain no fossils, and are the oldest rocks known. Granite, hornblende, quartz and some slates belong to this division.

Pudding Stone. See Conglomerate.

Pyrites. A mineral, composed of sulphur and iron. It is usually of a brass yellow, brilliant, often crystalized, and frequently mistaken for gold.

Quartz. A simple mineral, composed of silex. Rock crystal is an example of this mineral.

Rock. All mineral beds, whether of sand, clay, or firmly aggregated masses, are called rocks.

Sandstone. A rock composed of aggregated grains of sand.

Schist. Slate.

Seams. " Thin layers which separate strata of greater magnitude."

Sedimentary rocks. All those which have been formed by their materials having been thrown down from a state of suspension or solution in water.

Septaria. Flattened balls of stone, which have been more or less cracked in different directions, and cemented together by mineral matter which fills the fissures.

Serpentine. A rock composed principally of hydrated silicate of magnesia. It is generally an unstratified rock.

Shale. An indurated clay, which is very fissile.

Shingle. The loose water-worn gravel and pebbles on shores and coast.

Silex. The name of one of the pure earths which is the base of flint quartz, and most sands and sandstones.

Silicious. Containing silex.

Simple Minerals—Are composed of a single mineral substance. Rocks are generally aggregates of several *simple minerals* cemented together.

Slate. A rock dividing into thin layers.

Stratification. An arrangement of rocks in strata.

Strata. Layers of rock parallel to each other.

Stratum. A layer of rocks; one of the strata.

Strike. The direction in which the edges of strata crop out. It is synonymous with *line of bearing*.

Syenite and *Sienite.* A granite rock, in which hornblende replaces the mica.

Synclinal line and *Synclinal axis.* When the strata dip downward, in opposite directions, like the sides of a gutter.

Transition Rocks. A series of rocks which lie below the secondary and next above the primary, and are so called because they seem to have been formed at a period when the earth was passing from an uninhabited to a habitable condition. They contain numbers of characteristic fossils.

Trap—Trappean Rocks. Ancient volcanic rocks, composed of feldspar, hornblende and augite. Basalt, greenstone, amygdaloid and dolomite, are trap rocks.

Tuff or Tufa. "An Italian name for a volcanic rock of an earthy texture."

Unconformable. See conformable.

Veins. Cracks and fissures in rocks filled with stony or metallic matter. Most of the ores are obtained from metallic veins.

Veinstone. That mineral matter with which the ores or metallic contents of a vein are associated.

COASTING DISTANCES AROUND LAKE SUPERIOR.

View looking westward from a point a few miles west of Presque Isle.

	Miles.	Miles fm Saut	Course.	REMARKS.
From Saut de Ste Marie				
To Pointe Aux Pins,	8		west	Good landing.
Parisean Island,	15	23	n w	N and W sides of island rocky, dangerous landing. E and S sides good landing.
White Fish Point,	15	38	n w by w	Good landing.
From Saut de Ste Marie				
To Point Iroquois,	14		west	
Tonquamenon River,	19	33	w by n	Boat harbor.
White Fish Point,	15	43	n by e	Good landing.
Two Hearted River,	22	70	w by s	Boat harbor.
Grand Marais Harb.	26	96	west	Vessel harbor.
Hurricane River,	13	109	w by s	Sand beach—shoal water.
Miners River,	17	126	s w by w	Pictured Rocks.
Williams' Landing on Grand Island,	11	137	s w by w	Vessel harbor.
Riviere Aux Train,	10	147	w by s	Boat harbor.
Laughing Fish River,	16	163	w n w	" "
Chocolate River,	11	174	west	" "
Riviere Du Mort,	6	180	n n w	Harbor for large boats.
Presque Isle River,	8	188	n w	Good landing.
Garlic River,	8	196	n w by n	" "
Little Iron River,	9	205	n n w	" "
Yellow Dog River,	7	212	n w by w	" "
Pine River,	6	218	w n w	" "
Huron River,	8	226	w 1-2 n	Boat harbor.
Point Abbaye,	7	233	n w by w	Good landing.
Methodist Mission,	15	248	s w by w	" "
Catholic Mission,	5	253	s w by w	" "
From Point Abbaye				
To Portage River,	14	247	west	Five feet on the bar.
South end of Portage,	22	269	n n w	Vessels can come within 1 1-2 miles of this.

	Miles.	Miles fm Saut.	Course.	REMARKS.
Across the Portage,	1	270	n n w	
From Point Abbaye To Traverse Island,	10	243	n w	Bad landing.
Tobacco River,	16	259	n n e hf e	Boat Harbor.
Little Montreal River,	17	276	n e by n	Good landing a little to the east.
Copper Harbor,	18	294	n by w	Vessel harbor.
Agate Harbor,	9	303	west	" "
Grand Marais Harb.	4	307	w by s	Boat "
Eagle Harbor,	2	309	w by s	Vessel "
Cat Harbor,	2	311	w by s	Boat "
Eagle River,	5	316	w s w hf s	" "
Portage,	20	336	s w hf w	Good landing.
Little Trout River,	8	344	s w by w	" "
Elm River,	11	355	s w	" "
Misery River,	5	360	s w	" "
Sleeping River,	4	364	w by s	" "
Fire Steel River,	8	372	w s w	" "
Flint " "	1	373	s w	" "
Ontonagon "	6	379	s w by w	Six feet over sand bar.
Iron "	12	391	w by s	Boat Harbor.
Carp "	16	407	w by s	" "
Montreal "	25	432	s w by w	" "
La Pointe, (Madeline Island,)	20	452	n w hf w	" "
St. Louis River,	72	524	west	Eight feet over the bar.
By way of north coast,	--	552		
Two Island River,	75	477	n e	
Grand Portage,	65	412	e n e	Good landing.
Fort William,	40	372	n e by n	Vessel harbor.
Thunder Cape,	14	358	e s e	
S W end of Isle St. Ignace,	51	307	n e by e	
Slate Island,	50	257	east	
Pic River,	38	219	e hf s	Vessel harbor.
Otter Cove,	36	183	s by e hf e	
Michipicoten River,	58	125	e by s	Boat harbor.
Montreal River,	58	67	s by e	
Sandy Islands,	30	37	south	
Gros Cap,	21	16	s by e	Being 1076 miles around Lake Superior.
Pointe Aux Pins,	8	8	s e by e	

WORKING COMPANIES.

LAKE SUPERIOR COMPANY—1200 SHARES.

Trustees—David Henshaw, Boston, Mass.; Lemuel Williams, do.; C. C. Douglass, Acting Superintendent.

This is the pioneer company of this region, and is successfully at work on lease No. 2, on Eagle River. They have in operation, carried by water power, a stamping and crushing mill, and also a saw mill, improvements which no other company has, and which they have made only under great disadvantages and with much perseverance.

PITTSBURGH AND BOSTON COPPER HARBOR COMPANY.
6000 SHARES.

Trustees—Curtis G. Hussey; Charles Avery, Pittsburgh, Pa.; Thomas M. Howe, do.; William Pettit, do.; Thomas Jones, Boston, Mass.; Charles Scudder, do.; Dr. Wm. Pettit, Superintendent.

Leases Nos. 4, at Copper Harbor, 5, Eagle river, and 6 and 12, between Eagle river and the Portage. On No. 5 they have opened a vein most wonderfully rich in native silver.

COPPER FALLS COMPANY—3000 SHARES.

Trustees—Henry Crocker, Boston, Mass.; Charles Henshaw, do.; George L. Ward, Chicago, Ill.; Joshua Childs, Superintendent.

Lease No. 9, between Eagle Harbor and Eagle river. They are now taking from the vein on this location a mass of native copper much larger than the famous "Copper rock of the Ontonagon."

EAGLE HARBOR COMPANY—2000 SHARES.

Trustees—Samuel A. Hastings, Detroit, Mich.; Samuel

Barstow, do.; Samuel Coit, do.; Lewis Hall, do.; Thomas Sprague, Superintendent.

Lease No. 3, at Eagle Harbor.

NORTH AMERICAN COMPANY—3000 SHARES.

Board of Directors—President, Gurdon Williams, Detroit, Mich.; *Secretary*, Henry J. Buckley, do.; *Treasurer*, Gurdon Williams, *ex officio*, do.; Charles Howard, do.; Nelson P. Stewart, Pontiac, Mich.; Alfred Williams, do.; Horace C. Thurber, do.; Charles C. Hascall, Flint, Mich.; Thomas Richmond, Cleveland, Ohio; John Bacon, Superintendent.

No. 7, Eagle river. The officers of this company are elected annually, on the second Monday in October.

BOHEMIAN COMPANY—2500 SHARES.

Board of Trustees—President, Ramsay Crooks, New York; Edward Curtis, do.; William B. Maclay, do.; Zepheniah Platt, do.; John Owen, Detroit, Mich.; Simon Mendlebourn, Superintendent.

Nos. 32, 17 and 35, on Little Montreal river, Point Keewenaw.

BOSTON COMPANY—1700 SHARES.

Trustees—William Ward, Boston, Mass.; Dr. Thomas Jones, do.; Joab Bernard, Baltimore, Md.; Joseph L. Hempstead, Superintendent.

No. 15, between Copper and Agate Harbors. From the "White Dog Vein" on this location, they have raised a large mass of native copper, weighing about 900 lbs.

NEW YORK AND LAKE SUPERIOR COMPANY—6000 SHARES.

President—Edward Larned, Watervliet, N. Y.; *Trustees*, —— Talcott; Samuel Goveneur; —— Kimball, Boston, Mass.; C. G. Larned, Superintendent.

Nos. 20 and 21, on Riviere Du Mort, 18, at Agate

Harbor, 31, Point Keewenaw, 19, 22, 23, 24, and 25, on Montreal river. They are at work on Nos. 20, 18 and 31.

ONTONAGON COMPANY—2000 SHARES.

Trustees—John H. Kinzie, Chicago, Ill.; George C. Bates, Detroit, Mich.; Cogswell K. Green, Niles, Mich.; Julian Magill, Superintendent.

No. 98, on Ontonagon river. Nos. 68, 69, 70, 71, 72 and 73, at the head waters of the Elm and Misery rivers. They are at work on No. 70.

ISLE ROYALE COMPANY—2000 SHARES.

Trustees—Dr. Thomas Jones, Boston, Mass.; Charles Scudder, do.; George C. Bates, Detroit, Mich.; Cyrus Mendenhall, Superintendent.

Nos. 16 and 27, Copper Harbor. Nos. 28 and 29, Black river.

SUPERIOR COMPANY—3000 SHARES.

President—James D. P. Ogden, New York City; *Trustees*, Jacob LeRoy, do.; J. Townsend, do.; George N. Saunders, Superintendent.

Lease No. 1, west of Copper Harbor.

NORTHWEST COMPANY—2500 SHARES.

Trustees—Charles A. Secor, New York City; Horace Greely, do.; E. B. Hart, do.; Mr. Bailey, Superintendent.

Mr. Bailey has erected his buildings at Grand Marais Harbor, and is at work this winter immediately south, in the bluffs. The tract which this company claims is in dispute, and the case is before the Commissioners.

ORGANIZED COMPANIES.

NORTHWESTERN COMPANY OF DETROIT—3000 SHARES.

Board of Trustees—President, Zina Pitcher, Detroit, Mich.; Israel Coe, do.; Wesley Truesdail, do.; Samuel T. Douglass, do.

No. 8, Eagle River.

UNITED STATES COMPANY—3000 SHARES.

Trustees—Randall S. Rice, Detroit, Mich.; Morgan Bates, do.; Robert E. Roberts, do.; Managers, Andrew Harvie, do.; John Winder, do.

Nos. 50, 51, 52, 53, 54, 55 and 218, Ontonagon river.

ALBION COMPANY—3500 SHARES.

Trustees—S. Draper, Jr. New York; S. Jaudon, do.; Chauncey Bush, do.; Secretary, C. Livingston, do.

No. 10, Point Keewenaw.

BALTIMORE COMPANY—3000 SHARES.

Board of Directors—President, Jonas H. Titus, Jackson, Mich.; Secretary, Walter Budington; Treasurer, Smith Titus; Andrew T. McReynolds, Detroit, Mich.; John McReynolds, do.

Nos. 133, 134, 135 and 136, on Ontonagon river.

NEW YORK AND MICHIGAN COMPANY—5000 SHARES.

Board of Trustees—President, Henry Ledyard, Detroit, Mich.; Secretary, William A. Richmond, do.; Treasurer, Levi S. Humphrey, do.; Charles G. Hammond do.; Lucius Lyon, do.;

Nos. 181, 251, 252 and 253, in T. 47 N., Rs. 26 and 27 W. No. 61, on Point Keewenaw, Nos. 42, 299, 300 301, 302 and 303, on the Porcupine mountains. Nos. 57, 58, 304 and 305, on Montreal river. The extensive iron ore bed referred to by Mr. Hubbard, in his report, page 25, is included in the locations of this company, as will appear by reference to the map.

GLOBE COMPANY—4000 SHARES.

Board of Trustees—President, A. H. Newbould, Detroit, Mich.; Treasurer, James L. Lyell, do.; Secretary, William F. Randolph, do.; Pierre Teller, do.; E. F. Randolph, do.; James A. Van Dyke, do.

Nos. 447 and 448, on Ontonagon river. The officers of this company are elected annually, on the first Monday of February.

PENINSULA COMPANY—3500 SHARES.

Trustees—Henry F. Tallmadge, New York; Theophilus Peck, do.; James S. Hunt, do.; Secretary, C. H. Amerman.

Nos. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17, on the Ontonagon river. The officers of this company are elected annually, on the first Monday in November.

FRANKLIN COMPANY OF VERMONT.—5000 SHARES.—INCORPORATED BY THE LEGISLATURE OF VERMONT—CAPITAL $100,000.

Board of Trustees—President, Francis E. Phelps, Detroit, Mich.; Secretary, Warren Currier, Windsor, Vt.; Treasurer, Israel Coe, Detroit, Mich.; Joseph D. Hatch, Samuel Peck, Saut de Ste Marie; John Watkins, Samuel Coit, Detroit, Mich.

Nos. 45, 46, 47, 48, 49, and 56, on Huron river.

GREAT WESTERN AND LAKE SUPERIOR COMPANY——2000 SHARES.

Trustee—William W. Johnson, Detroit, Mich.

Nos. 444, 445, and 446, on the Ontonagon river. The funds and property of this company are vested in one or three Trustees.

MACKINAC AND LAKE SUPERIOR COMPANY—4500 SHARES.

Trustees—Ramsay Crooks, New York; Michael Douseman, Samuel Abbot, and Samuel K. Haring, Mackinac, Mich.; Justin Rice, St. Clair, Mich.

Nos. 27, 474, 475, 476 and 477, on Black and Presque Isle rivers.

ALGONQUIN COMPANY OF DETROIT.—3000 SHARES.

Board of Trustees—President, Josiah R. Dorr, Detroit, Mich.; Secretary, Daniel P. Bushnell; Treasurer, Benjamin L. Webb, Detroit, Mich.; Curtis Emerson, and Michael E. Van Buren, Detroit, Mich.; Levi Allen, Buffalo, N. Y.; Charles Whittlesey, Cleveland, Ohio.

Four locations on Sleeping river. The officers of this company are elected annually on the second Monday of July.

BOSTON, NEW YORK AND LAKE SUPERIOR COMPANY—3000 SHARES.

Board of Trustees—President, Charles Noble, Monroe, Mich.; Secretary, Benjamin F. Fifield, do.; Treasurer, Daniel S. Bacon, do.; Dan B. Miller, do.

Nos. 44 and 411, on the Porcupine mountains.

MANHATTAN COMPANY—3500 SHARES.

President, E. Smith Lee, Detroit, Mich.; Secretary, Daniel Dunning; Treasurer, Theodore Williams, Detroit, Mich.; Trustees, Oliver M. Hyde, Thomas Palmer, Benjamin F. H. Witherell, and Richard J. Connor, Detroit, Mich.

Nos. 381, 382 and 383, on the Porcupine mountains. The officers of this company are elected annually on the first Monday of September.

PORCUPINE MOUNTAIN COMPANY—3000 SHARES.

President, Benjamin F. H. Witherell, Detroit, Mich.; Secretary, Samuel G. Watson, do.; Treasurer, Israel Coe, do.; Trustees, Thomas Palmer, Oliver M. Hyde, Alpheus S. Williams, and Mason Palmer, Detroit, Mich.; Henry Stanley; Arunna W. Hyde, Detroit, Mich.

No. 412, on the Porcupine mountains.

OLD SETTLERS' COMPANY—4000 SHARES.

Board of Directors—President, John R. Williams, Detroit, Mich.; Secretary, Charles Peltier, do.; Treasurer, James Abbott, do.; James A. Vandyke, Peter Desnoyers, Francis Cicotte, and Philip Aspinall, do.; Frederick S. Littlejohn, Cleveland, Ohio; John B. Waring, do.

Nos. 346 and 347, on Elm river, 350, 351 and 354, on Iron river, 349, 352 and 353, on Carp river. The officers of this company are elected annually on the second Monday of October.

NATIONAL COMPANY—3000 Shares.

Board of Directors—President, James B. Hunt; Secretary, William S. Fish; Treasurer, James A. Weeks; Phineas Davis, H. C. Knight, Danforth Petty, and Jeremiah Clark, Pontiac, Mich.

Four locations on Point Keewenaw, and three on Elm river. The officers of this company are elected annually, on the first Monday of January.

HAYS' COMPANY—3000 Shares.

Board of Directors—President, John Hays, Pittsburgh, Pa.; Vice President and Secretary, Andrew T. McReynolds; Treasurer, John McReynolds; Dr. Thomas B. Clark, and John H. Sinclair, Detroit, Mich.

The officers of this company are elected annually, on the second Monday of October.

JACKSON COMPANY—3100 Shares.

Board of Trustees—President, Abram V. Berry; Secretary, Frederick W. Kirtland; Treasurer, Philo M. Everett; George W. Carr, and William A. Ernst, Jackson, Mich.

No. 593, somewhere in T. 46 N., R. 27 or 28 W. The officers of this company are elected annually, on the first Tuesday of June.

NEW ENGLAND AND MICHIGAN COMPANY—3600 Shares.

Board of Trustees—President, David A. Noble; Secretary, Stephen G. Clark; Treasurer, Horace L. Skinner; *James Darrah*, and Walter P. Clark, Monroe, Mich.

Nos. 246, 247, 248 and 249, on Portage Lake.

MINERAL CREEK COMPANY—5000 Shares.

Board of Trustees—President, Isaac E. Crary; Secretary, George C. Gibbs; Treasurer, Digby V. Bell; Jarvis Hurd, and George Ketchum, Marshall, Mich.

Nos. 357 and 358, on the Porcupine mountains.

BOSTON AND NORTH AMERICAN COMPANY—5000 Shares.

Board of Trustees—President, George L. Oakes, Boston, Mass.; Secretary, Henry R. Williams; Treasurer, DeWitt C. Lawrence; William B. Grenell, and Benjamin Smith, Grand Rapids.

Two locations somewhere in the vicinity of Iron river.

LAKE SHORE COMPANY—3000 Shares.

Trustees—Aaron Clark, S. W. Anderson, Nathaniel Weed, A. B. Hays, and Marshall O. Roberts, New York city.

Location No. 2, between Eagle river and the Portage.

STE MARIE FALLS COMPANY—4500 SHARES.

Trustees—Samuel Ashman, Saut de Ste Marie; Peter B. Barbeau, do.; Stephen R. Wood, do.; John P. Richardson, do.; Philetus A. Church, do.

This company has secured four islands in the falls of Riviere de Ste Marie, as desirable "locations" for erecting stamping mills, &c., and it is their humble opinion that, at these points, sufficient water power may be obtained for propelling a large amount of machinery.

FORSYTH COMPANY—3000 SHARES.

Trustees—John A. Kennedy, Charles A. Secor, and William F. Schmdt, New York city.

No. 36 1-2, on Point Keewenaw.

SILVER AND COPPER COMPANY OF ONTONAGON RAPIDS—2500 SHARES.

Trustees—J. L. Graham, J. L. O'Sullivan, New York city, and one other unknown.

Four locations on the Ontonagon

CHIPPEWA COMPANY—1200 SHARES.

Trustees—Edward Curtis, New York, city; Joseph Bell, and Francis Crowningshield, Boston, Mass.

Twenty-one locations on Black and Ontonagon rivers.

CHARTER OAK COMPANY—5000 SHARES.

Trustees—Elisha Tyler, Detroit, Mich.; Silas H. Holmes, do.; Jacob M. Howard, do.

FRANKLIN COMPANY OF BOSTON—3000 SHARES.

Trustees—S. F. Coolidge, Boston, Mass.; Samuel Hunt, do.; T. J. Lobden, do.

Nos. 186, 187, 188 and 292, on Carp river, near Chocolate river.

ALGONQUIN COMPANY OF BOSTON—1500 SHARES.

Trustees—H. A. S. Dearborn, Boston, Mass.; John N. Barbour, do. and one other unknown; Treasurer, John N. Barbour. Ten locations.

NEW ENGLAND COMPANY—5000 SHARES.

Trustees—E. A. Raymond, Boston, Mass.; David Kimball, do.; E. W. Stone, do.; Clement Willis, do.; John Rayner, do.; J. B. Smith, do.; George Wheelright, do.

Nos. 384, 385, 386, 387, 388, 389, 390, 391, 392, 395, 396, 397, and 415, on Point Keewenaw.

ST. CROIX COMPANY.

Trustees—Rufus Choate, Boston, Mass.; Robert Rantoul, Jr. do.; Caleb Cushing, Newburyport, Mass.

One location, on St. Croix river, and several on Lake Superior.

CARP RIVER COMPANY OF BOSTON—6500 SHARES.

Board of Trustees—President, Charles Henshaw, Boston, Mass.; Treasurer, Joseph M. Brown, do.; John T. Heard, do.

NORTHWESTERN COMPANY OF FLINT—3000 SHARES.

President—R. D. Lamond, Flint, Mich.; Secretary, *Felix B. Higgins*, do.; Treasurer, Grant Decker, do.; *Trustees, E.* Vandeventer, do.; A. T. Crosby, do.

Nos. 311, 312, 313, 314, 315, 316, 317, 318 and 319, on Portage Lake, 326, 327, 328, 329, 330 and 331, on the Porcupine mountains, and three others.

CARP RIVER GOLD AND SILVER MINING COMPANY—3000 SHARES.

President—Michael Douseman, Mackinac, Mich.; Secretary, John Prentiss, Detroit, Mich.; Trustee, H. T. Backus, do.

Several locations on Carp river, near Chocolate river.

MASSACHUSETTS COMPANY.

Trustees—William Freeman, Boston, Mass.; John T. Heard, do.; and one other unknown.

Nos. 13 and 14, on Point Keewenaw.

LAC LA BELLE COMPANY—2500 SHARES.

Trustees—S. Starkweather, James Brooks, and William W. Campbell, New York city.

No. 350, and two others on Lac La Belle.

AMERICAN EXPLORING COMPANY—5000 SHARES.—INCORPORATED BY THE LEGISLATURE OF VERMONT—CAPITAL $100,000.—COMPANY'S OFFICE ST. JOHNSBURY, VERMONT.

President—Francis E. Phelps, Detroit, Mich.; Secretary, Horace Paddock, St. Johnsbury, Vt.; Treasurer, Samuel Coit, Detroit, Mich.; Samuel Peck, Saut de Ste Marie, agent for Michigan.

The funds and property of this company are vested in a board of nine Trustees.

COLUMBIAN COMPANY—3000 SHARES.

Board of Directors—President, David Smart; John Drew, Theodore Williams, Selah Reeve, and Elias C. Cromwell, Detroit, Mich.; Florence Mahoney, and Daniel C. Hyde, New York city.

Nos. 132, on Ontonagon river, and 398, 399, 400, 401, 402 and 403, on Misery river.

BLACK RIVER COMPANY—3000 SHARES.—INCORPORATED BY THE LEGISLATURE OF MARYLAND—CAPITAL $30,000.

President—John S. Smith, Baltimore, Md.

One three-mile location on Black river.

PITTSBURGH AND CHIPPEWA COMPANY—3000 Shares.

President—James May, Pittsburgh, Pa.

Five or six locations in the vicinity of Lac La Belle.

MICHIGAN COMPANY—3000 SHARES.

Board of Directors—President, Origen D. Richardson, Secretary, Don C. Buckland; Treasurer, Abraham B. Matthews; Gideon O. Whittemore, Alfred J. Boss, Ephraim S. Williams, and Moses Wisner, Pontiac, Mich.

Nos. 221, 222, 223, 259, 268, 467, 468 and 469, on the Montreal river. The officers of this company are elected annually, on the first Monday of January.

BOSTON AND DETROIT COMPANY—3000 Shares.

Trustees—Charles Scudder, Dr. Thomas Jones, Charles L. Bartlett, and William Underwood, Boston, Mass.; George C. Bates, Detroit, Mich. This company has three three-mile locations on Point Keewenaw.

MARSHALL AND BOSTON LAKE SUPERIOR COMPANY—5000 Shares.

Board of Trustees—President, Henry W. Taylor; Secretary, George S. Wright; Treasurer, Charles C. Gorham; Digby V. Bell, and Robert Cross, Marshall, Mich.

Nos. 217, on Carp river, near Chocolate river, 355 on Iron river, 464, Ontonagon river, 465 and 466, and two others.

UNION COMPANY.

Trustees—John J. Palmer, Robert Hyslop, Ramsay Crooks, and Daniel S. Miller, New York city.; Charles W. Borup, La Pointe, Lake Superior.

COPPER ROCK COMPANY—3000 Shares.

Trustees—Theodore Olcott and Thaddeus Joy, Albany, N. Y.; Lucius Tuckerman, Chicago, Ill.

Nos. 113, on Ontonagon river, 530, Black river, 539, 540 and 541, on Tobacco river, Point Keewenaw.

GREEN MOUNTAIN AND LAKE SUPERIOR COMPANY—3500 Shares.

President—A. S. Williams; Secretary, E. Smith Lee; Treasurer, Alex. W. Buel; Trustees, Oliver M. Hyde, and Edward Doyle, Detroit, Mich.; James K. Hyde, Sudbury, Vt.; Edward Jackson, Brandon, Vt.; Henry Stanly, West Poultney, Vt.; Pitt W. Hyde, Castleton, Vt.; Russell Gage, Detroit, Mich.

No. 413, on the Porcupine mountains.

Keewenaw Company of Boston, 2500 shares.

Algomah Company of Boston, eight locations.

Portage Company of New York, 3000 shares.

Cuyahoga Copper Smelting Company of Cleveland. Incorporated by the Legislature of Ohio.

Ohio Copper and Silver Smelting Company, of Cleveland. *Incorporated by the Legislature of Ohio.*

LIST OF LOCATIONS,

Made on the south shore of Lake Superior, upon Permits issued from the War Department at Washington, and applications to the Mineral Agency at Copper Harbor, from August, 1844, to November, 1845.

No.	NAME.	RESIDENCE.	No.	NAME.	RESIDENCE.
1	Wm Pettit	Pittsburgh	40	Wm Ward	Mass.
2	Joseph Pettit	Ohio	41	R Adams	Virginia
3	N D Miniclier	Cop. Harbor	42	Lucius Lyon	Detroit
4	Dan'l Ruggles	" "	43	Wm Robinson, Jr	Allegany
5	Wm Ruggles	Unknown	44	C M Humphrey	Michigan
6	W J Welles	Detroit	45	Sam'l Peck	St Jo Island
7	T B Biddle	"	46	A Sherman	Mackinac
8	F Norvell	"	47	R Chapman	"
9	D A Phœnix	New York	48	G F Randolph	Detroit
10	C Bestor	Washington	49	Alba Jones	Unknown
11	J A Smith	"	50	C Wickware	Detroit
12	J V Watson	Detroit	51	R S Rice	"
13	James Higgins	"	52	Jno Winder	"
14	R R Richards	"	53	M Bates	"
15	A Morell	New York	54	A Harvie	"
16	C Bush	"	55	R E Roberts	"
17	S W Tucker	"	56	P Ord	Ste Marie
18	T Titus	Philadelphia	57	C Colton	Michigan
19	M Coryell	"	58	J E Skinner	"
20	S W Bickley	"	59	C C Douglass	Eagle River
21	C Payne	Detroit	60	C Comstock	Michigan
22	A Stewart	"	61	L S Humphrey	"
23	G Decker	"	62	J Stuyker	Rome N Y
24	J Higgins	"	63	J Wilkinson	Syracuse N Y
25	H Whitney	Boston	64	J Roy	Watervliet
26	J Childs	Wisconsin	65	D B Jewett	West Troy
27	R D Cutts	Washington	66	E C Litchfield	Watervliet
28	G Kemble	Cold Springs	67	A H Geisse	Detroit
29	H Morris	New York	68	J H Kinzie	Chicago
30	Wm Kemble	"	69	Geo C Bates	Detroit
31	G W Morris	"	70	A H Hanscom	Pontiac
32	J Blunt	"	71	C K Green	Niles
33	A H Ward	"	72	John Norvell	Detroit
34	W H Hudson	"	73	J Howard	"
35	L Waterbury	"	74	J L Helfenstein	Chicago
36	J M Waterbury	"	75	G Campbell	"
37	C Douglass	Wisconsin	76	A W Magill	"
38	J Henshaw	Mass.	77	J Magill	"
39	Tho's Cowles	Connecticut	78	T L Wharton	Philadelphia

No.	Name.	Residence.
79	W G Alexander	Philadelphia
80	T Edwards	Ste Marie
81	W Hadding	Cop. Harbor
82	J B Campbell	“
83	L Richardson	“
84	J R Moorehead	Pittsburgh
85	W B Enghurst	“
86	J B Moorehead	“
87	B Ford	“
88	L W Tappan	Boston
89	J May	Pittsburgh
90	P McCormick	“
91	J B Murray	“
92	T Scott	“
93	L Tibbatts	Newport Ky
94	H Higgins	Detroit
95	G H Hazleton	Flint
96	E H Thompson	“
97	D H Holcomb	Chicago
98	J L Hempstead	Agate Harb.
99	H E Davis	New York
100	H Edwards	Boston
101	C Stoddard	“
102	John Tappan	“
103	C Tappan	“
104	T Myers	Pittsburgh
105	J Myers	“
106	C Painter	“
107	N Vorthey	“
108	G C Warner	“
109	E Griffin	Cop. Harbor
110	J E Berry	“
111	A Clark	“
112	A Mayhew	“
113	J Paul	Ontonagon
114	J J Boyd	New York
115	Ed Hinker	“
116	J A Swartz	“
117	J De Ruyter	“
118	A H Mickle	“
119	M Dougherty	“
120	W Chamberlain	“
121	M X Harmony	“
122	G Hopkins	“
123	W Carell	“
124	W Hall	**Albany**
125	***G K Lyster***	**New York**
126	A Jones	New York
127	T K Kettel	“
128	E Chandler	“
129	W Warder	Springfield O
130	A T Hall	Detroit
131	J Burgess	Ripley N Y
132	C Y Richmond	Cleveland
133	O D Conger	Jackson
134	M Titus	“
135	P S Titus	“
136	J H Titus	“
137	T Chapin	Buffalo
138	G R Griswold	Detroit
139	E J Roberts	“
140	K Dygert	“
141	C Richmond	Aurora N Y
142	J Marsh	“
143	J Campbell	Philadelphia
144	G Moran	Detroit
145	S McCulley	Philadelphia
146	B H Brewster	“
147	A Gouin	Detroit
148	W J Craus	“
149	A S Hall	Glastonbury
150	E Larned	Watervliet
151	C G Larned	“
152	J Hitchcock	“
153	S W Caulkins	West Troy
154	R Hayford	Watervliet
155	D Thornton	West Troy
156	S Maynard	Richmond Va
157	C B Wheelock	Green Bay
158	D Hamilton	Watervliet
159	C Kenyon	“
160	T Williams	Newburgh
161	J Eights	Albany
162	A Fuller	Washington
163	H Atwood	Mt Clemens
164	A Ashley	Philadelphia
165	R Miller	Richmond Va
166	J J Roberts	Newburgh
167	J Brown	Detroit
168	E Prentiss	“
169	R S Cox	Washington
170	C Bradley	“
171	M St C Clark	“
172	C J Mourse	“

No.	NAME.	RESIDENCE.
173	G Lambly	Cop. Harbor
174	P Quinn	“
175	W H Howe	Pittsburgh
176	J Chester	Detroit
177	T Picket	Cop. Harbor
178	J Gorneo	Ste Marie
179	J Darrah	Monroe
180	J M Sterling	Unknown
181	J G Clark	“
182	J Sahl	Cop. Harbor
183	J Adams	Washington
184	S B Borneau	“
185	H B Sweeney	“
186	J J Peavey	Maine
187	C Boyle	Washington
188	Geo Sweeney	“
189	H Knollman	Cop. Harbor
190	F Wallner	“
191	K Muller	“
192	J Snyder	“
193	J Mymner	“
194	C Bourassan	Mackinac
195	L Cantuim	Ste Marie
196	D Millett	Mackinac
197	W Cameron	Ste Marie
198	P La Riviere	Mackinac
199	F Webster	Boston
200	F Marsh	New York
201	W A Cheever	Boston
202	H Quinn	Washington
203	C W Marsh	Boston
204	D A Hall	Washington
205	T Tyler	“
206	J Myrne	Baltimore
207	T Donoho	Washington
208	A Crawford	Cop. Harbor
209	N Bowdoin	Green Bay
210	W O'Brien	Cop. Harbor
211	P Deitzer	Detroit
212	L C Forsyth	“
213	A Olds	St Joseph
214	C Babe	Detroit
215	D Munger	Marshall
216	C T Gorham	“
217	H W Taylor	“
218	H Jacobs	Michigan
219	*G O Whittemore*	Pontiac
220	J Butterfield	Pontiac
221	H Park	“
222	E B Wales	Detroit
223	C C Park	Pontiac
224	A Clark	Unknown
225	W Schlatter	Chicago
226	W M Ord	Ste Marie
227	C Mendenhall	La Point
228	J Smith	Portsmouth
229	J Bartlett	“
230	E Bartlett	“
231	H Coffin	“
232	C H Ladd	“
233	J D Symes	“
234	J Cutter	“
235	L Odell	“
236	S Gookin	“
237	G Jaffrey	“
238	R C Cutter	Ch'lest'n Ms.
239	C W Brewster	Portsmouth
240	Geo Parson	“
241	Sam'l Rec	“
242	A H Ladd	“
243	J W Emmons	“
244	W C Rollins	“
245	C T Tappan	“
246	W C Sterling	Monroe
247	W P Clark	Detroit
248	W W Prentice	“
249	H L Skinner	“
250	W P Clark Jr	“
251	C G Hammond	“
252	R Gillett	“
253	H Ledyard	“
254	J R Grout	“
255	G Williams	“
256	A Williams	Pontiac
257	N P Stewart	“
258	H C Thurber	“
259	S Stevens	“
260	J Herrick	Maine
261	J F Webb	Washington
262	A Knowles	Maine
263	R Parks	Wisconsin
264	Isaac Gage	Augusta
265	S L Harris	Maine
266	N Sargent	Philadelphia

No.	Name.	Residence.	No.	Name.	Residence.
267	H J Buckley	Detroit	328	Elias Williams	Flint, Mich.
268	O D Richardson	Pontiac	329	E Vandewater	“
269	J M Williams	“	330	W Moon	“
270	W Weber	Cop. Harbor	331	D D Dewey	“
271	H Falley	“	332	W Richards	“
272	J Erwin	“	333	G Beris	Cop. Harbor
273	J Colbeck	“	334	W H Longridge	“
274	F Bergman	“	335	H N Howard	Pontiac
275	C Kundert	“	336	P Hogan	“
276	C Hoffman	“	337	A Merryweather	“
277	C Henshaw	Boston	338	W H Mercer	“
278	R Choate	“	339	E Trufont	Mt Clemens
279	J H Adams	“	340	D Burt	“
280	C Scudder	“	341	J Wylde	“
281	C W Painter	Pittsburgh	342	N Wyckoffe	“
282	J Painter	“	343	J Raymond	Detroit
283	J Graham	“	344	A D Terbush	“
284	Robert Swan	“	345	C E Shepard	Aurora, N Y
285	A B Haine	New York	346	J L Cuyler	“
286	J A Constant	“	347	J B Dumont	Allegan
287	J Tuckerman	“	348	D C Littlejohn	“
288	J Ward	Ontonagon	349	G F Littlejohn	“
289	J Davis	Boston	350	J B Waring	“
290	S Bartlett	“	351	F J Littlejohn	“
291	J Davis	“	352	F S Littlejohn	“
292	F W Davis	“	353	E Willis	“
293	P (S) Sheldon	“	354	C C Willis	“
294	Tho's Dixon	“	355	T Jones	Boston
295	J Hanna	Pittsburgh	356	S Dickey	Penn.
296	V Saunders	Kentucky	357	D V Bell	Marshall
297	E F Gleason	Cop. Harbor	358	B Humphrey	“
298	W Bennett	“	359	G S Wright	“
299	J S Farrand	Detroit	360	L Hanna	New Lisbon, C
300	W A Richmond	“	361	J Glenn	Baltimore
301	Wm Hale	“	362	W C Glenn	“
302	F A Harding	“	363	E T Ellicott	“
303	E Brooks	“	364	A Ellicott	“
304	J R Broadhead	New York	365	B Ellicott	“
305	A Livingston	Unknown	366	E Chaising	“
306		“	367	L De Milham	“
307	Names not	“	368	E Ellicott	“
308		“	369	J P Murphy	Pittsburgh
309	registered	“	370	J Davis	Cop. Harbor
310		“	371	T Perry	“
311	H S Hay	Detroit	372	H Sturdy	“
312	J J Rinchard	“	373	E C Raum	Ontonagon
313	S Green	“	374	W W Spaulding	Cop. Harbor
314	J Anderson	Utica, N Y	375	J Carl	“
315	Ed Moran	Detroit	376	C Lewis	“
316	F La Clair	“	377	R Jennings	Cleveland
317	J Brinkman	“	378	C Cheney	Pittsburgh
318	P Lemming	“	379	D Kendall	Plattsburgh
319	W Miller	“	380	M Wallace	Cop. Harbor
320	N Updegraph	Sidney, Ohio	381	H N Munson	St. Clair
321	J Painter	Pittsburgh	382	J B Watson	Detroit
322	J W Webb	New York	383	T Palmer	“
323	G A Barstow	Boston	384	R Hall	Boston
324	C W Cutter	Portsmouth	385	J Lilly	“
325	W H Morell	New York	386	Asa Fisk	“
326	*J A Trumbull*	Flint, Mich.	387	D Kimball	“
327	*C E Dewey*	“	388	N Waterman	“

No.	Name.	Residence.
389	E W Stone	Boston
390	A Randall	"
391	S Curtis	"
392	J H Sears	"
393	V Brown	"
394	E E Davis	"
395	A W Benton	"
396	E A Raymond	"
397	M Kimball	"
398	S C Watts	Cop. Harbor
399	E F Gleason	"
400	J O Williams	"
401	M Sayer	"
402	L Southbird	"
403	L Shawen	"
404	W H Boyer	Reading, Pa.
405	W R Gormley	Pittsburgh
406	W W Dallas	"
407	G R White	"
408	F Libbey	Boston
409	R Homer	"
410	T Ten Eyck	"
411	T Palmer	Detroit
412	E Doyle	"
413	O M Hyde	"
414	O Chamberlain	Pontiac
415	J Alexander	Boston
416	N G Kartright	New York
417	H H Hale	Connecticut
418	C H Ta'cott	"
419	J L Boswell	Hartford
420	J P Cunningham	New York
421	M Matthews	Carthage, N Y
422	J Blauvelt	Albion, Mich
423	W A Cheever	Boston
424	D A Hall	Washington
425	E Harriman	Tennessee
426	E Curtis	New York
427	W G Snethen	Washington
428	W Cameron	Ste Marie
429	P La Riviere	Mackinac
430	D Millett	"
431	L Cantaim	Ste Marie
432	C Bourassan	Mackinac
433	C Merritt	Battle Creek
434	J E Hyde	Pontiac
435	J McCabe	"
436	Z B Knight	"
437	T J Hunt	"
438	H Hubbard	Chicago
439	T H Perden	Virginia
440	J F Gleason	Maine
441	C B Marvin	Monroe
442	M P Marvin	"
443	T H Hawley	"
444	A Godard	Detroit
445	C Holmes	"
446	W W Johnson	"
447	J A Vandyke	"
448	J P Teller	"
449	P Hussey	Ohio
450	D D Davis	Cop. Harbor
451	E Jones	"
452	M Mason	Independence
453	D O'Connor	Rome, N Y
454	B Sweeney	Huron, O.
455	Wm White	Pittsburgh
456	C Kidder	Baltimore
457	Wm Robinson	"
458	Geo Crosby	"
459	Jas S Allen	Pontiac
460	S Chamberlain	"
461	M Parsons	Marshall
462	H A Tillotson	"
463	A L Hayes	"
464	A C Parmelee	Hastings, Mich.
465	C P Kellogg	Marshall
466	Rob't Cross	"
467	A L Leland	Pontiac
468	L Bacon	"
469	W J Nelson	"
470	A B Matthews	"
471	B O Williams	"
472	O F Wisner	"
473	J C Smith	"
474	J Almy	Grand Rapids
475	J Richmond	Aurora, N Y
476	S K Haring	Mackinac
477	A W Spies	New York
478	B Banks	Marshall
479	Milo Soule	"
480	H H Sylvester	Washington
481	R C Weightman	"
482	G C Thomas	"
483	James Adams	"
484	S B Boarman	"
485	H B Sweeney	"
486	W W Rowe	Bangor, Me.
487	Chas O Record	"
488	M S Palmer	"
489	E Bowen	"
490	W W Hudson	"
491	B Miles or R Niles	"
492	J M Oakley	"
493	J Otis	"
494	A H Howard	"
495	E S Lee	Detroit
496	R H Page	"
497	H M Smith	"
498	M B Maclay	"
499	R W Morrison	"
500	J G Thurber	Monroe
501	A E Wing	"
502	C Noble	"
503	J Q Adams	"
504	H Smith	"
505	E Jewett	Unknown
506	T W Patchin	"
507	R D Hubbard	"
508	T Lamb	"
509	W H Simpson	"
510	Henry Swift	"